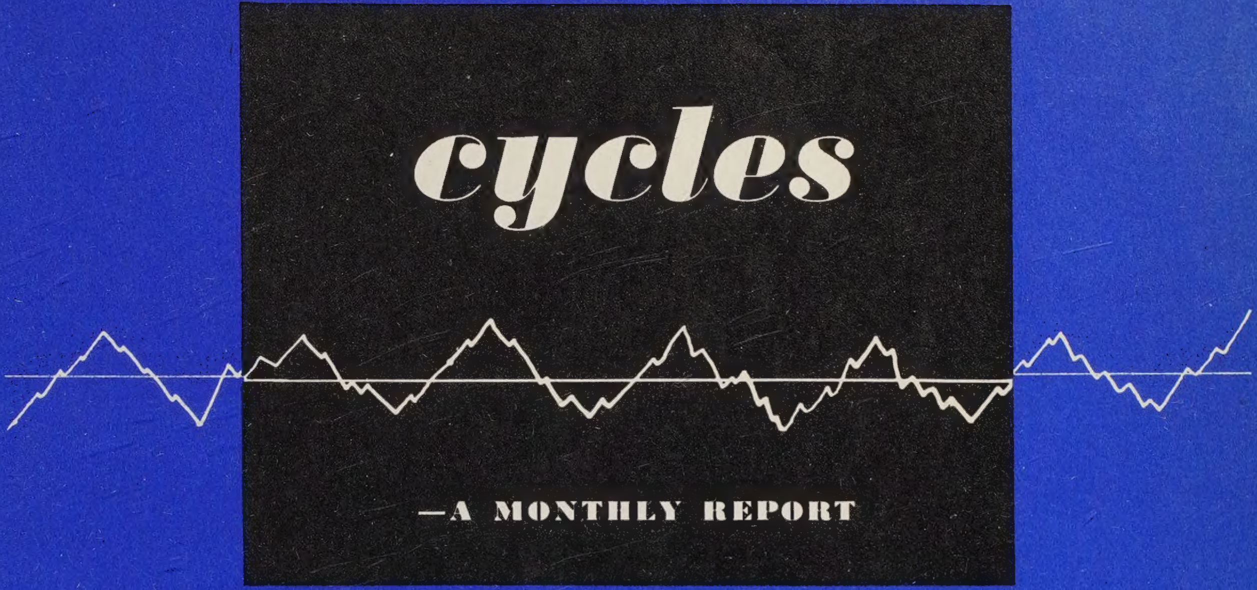


cycles

—A MONTHLY REPORT

September 1951

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

CONTENTS

Page

THE DIRECTOR'S LETTER 241

RESEARCH

The Synthesis of Long Cycles in Stock Prices 245

Sunspots before 1750 253

The 19.4-Year Cycle in Railroad Stock Prices 255

TECHNICAL

Techniques Involved in the Synthesis of Ten Possible Long Cycles in Stock Prices 261

Techniques Involved in the Determination of the 19.4-Year Cycle in Railroad Stock Prices . . . 263

FOUNDATION AFFAIRS 264

LETTERS 266

QUESTIONS & ANSWERS 269

ADDITIONS TO THE LIBRARY 272

THE FOUNDATION FOR THE STUDY OF CYCLES

The Committee of the Foundation consists of the following scientists and administrators:

UNITED STATES OF AMERICA

Copley Amory, Chairman Emeritus

Charles Greeley Abbot
Research Associate
Smithsonian Institution

Harold Elmer Anthony
Chairman and Curator
Department of Mammals
American Museum of Natural History

George Baekeland, Chairman of the
Committee of the Foundation
The Bakelite Corporation

Harold Gardiner Bowen
Vice Admiral, U.S. Navy, Retired
Executive Director, Thomas Alva
Edison Foundation

Hon. W. Cameron Forbes
Member, Board of Trustees
Carnegie Institution of Washington
and
Life Member of the Corporation
Massachusetts Institute of Technology

Daniel Trembly MacDougal
Former Director
Department of Botanical Research
and
Laboratory of Plant Physiology
Carnegie Institution of Washington

Harlow Shapley
Director of the Observatory
Harvard University

CANADA

Hon. Charles Camsell
Former Commissioner
Northwest Territories

Frank Cyril James
Principal and Vice-Chancellor
McGill University

GREAT BRITAIN

Sir Patrick Ashley Cooper
Governor
Hudson's Bay Company

Julian Sorrell Huxley
Director General of the United Nations
Educational, Scientific and Cultural
Organizations

CYCLES — A Monthly Report is published by the Foundation for the Study of Cycles every month except during July and August at the Foundation's offices at 9 East 77th Street, New York 21, N. Y. Subscription rates $10.00 a year. Entered as second class matter at the Post Office at New York, N. Y. Letters for the personal attention of the Director should be sent to East Brady, Pennsylvania.

cycles
—a monthly report

The Official Bulletin of the Foundation for the Study of Cycles

VOLUME II NUMBER 7 SEPTEMBER 1951

The Director's Letter

Dear New Member:

I hope our old members will forgive me if, in my monthly letter, I ignore them for this one issue, and address myself specifically to our new members.

I am going to start at the very beginning, just as if you knew nothing about cycles.

Cycles of reasonable regularily occur throughout nature. The beating of your heart is a good example. So is the yearly cycle of temperature, or the 12½-hour cycle of the tides.

When a cycle is sufficiently regular it is called a rhythm. " Rhythm " comes from a Greek word meaning " measured time. " The word is applied to cycles which recur with a beat. All the examples given above are rhythms.

There are three reasons why the study of cycles and rhythms is important to you.

Regular Cycles Give Predictability

First, where you have a regular cycle you have predictability. Your electric clock works accurately because of this fact. It keeps time because the alternating current cycles which run it are regular.

Where you have partial regularity you have partial predictability. For example, suppose you have a chart recording your heart beats over the period of a minute. Now look at the first half of it only. If you count 30 beats in the 30 seconds you have under examination you will not be far wrong if you forecast another beat at 31 seconds, another at 32 seconds, etc.

Perhaps, if your heart speeded up a little, you would be quite wrong if you made your projection ten beats ahead, but by making your forecast only a beat at a time and revising your forecast each beat, you could probably make your prediction come out fairly well.

Another example of partial predictability: Suppose you knew that February 1st is, in New York City, on the average, the coldest day of the year. Suppose, on the basis of this information, you forecast February 1, 1952 as the coldest day of next winter. It is almost certainly true that February 1st will be colder than August 1st, but in any given year it may not be the very coldest day by as much as one or two months. The cycle of the year influences the weather but it does not completely dominate it. From a knowledge of the cycle of the year alone you could forecast the coldest day only with wide tolerences, yet the cycle of the year is very real.

Cycles Show Us Our Ignorance

The second reason that the study of cycles is important arises from the fact that wherever you have rhythmic variation—or for that matter pattern of any sort—you probably have a cause. For example, if you scatter iron filings on my desk you would expect them to be distributed at random over its surface. If, to the contrary, you find them arranging themselves into a pattern, you have a right to assume that some unknown force is present—perhaps a powerful magnet in my top drawer.

Similarly, if you find pattern, or more specifically rhythm (reasonably regular cycles), in the alternate thickness and thinness of tree rings or rock strata, or in the abundance of insects, or in the prices of common stocks, you may be sure that there is a cause for such behavior. Also you may be sure that if you do not know that cause you do not fully understand the behavior with which you have to deal. Thus the study of cycles reveals to us our ignorance, and is therefore very disturbing to people whose ideas are crystalized. " If there are regularly recurring ups and downs in business or in prices, all I have ever learned is wrong, " an eminent economist once told me; and he added, in a moment of unusual candor, " I simply cannot afford to accept such an idea. All my life's work would be ruined. " Many doctors in the days of Pasteur must have felt much the same way about germs.

Identical Cycles Suggest Interrelationship

The study of cycles has a third value. Such study can indicate possible cause-and-effect relationships, thus helping to solve the very problems it reveals.

For example, when I was a boy I noticed that the moon came up about an hour later each night. When I visited the seashore I noticed also that the tide came in half an hour or so later each twelve hours. I did not have the wit to go on from there to note that two consecutive tides were delayed by exactly the same amount of time as was the moon, and therefore that there was perhaps some connection between the two. I did not have the wit to make this observation, I say, but one of the older astronomers did. In doing so he demonstrated the third value of a knowledge of cycles: Where the rhythms in two different phenomena have the same average time span, you are justified in suspecting a possible direct or indirect interrelationship between the phenomena.

Scientists Interested

For these three reasons many scientists are interested in the study of cycles. First, it is the business of science to predict; second, it is the business of science to solve mysteries and to learn the " how " of things; and third, the true scientist welcomes any tool that gives him hints as to possible cause and effect relationships. Perhaps 3,000 scientists, the world over, have concerned themselves with the subject, and have written scientific papers embodying the results of their observations.

Scientists however, like all the rest of us, are pretty self centered. Thus the mammalogist interested in cycles in animal abundance is usually not much interested in geological cycles, or in astronomical cycles, or in business cycles. He is primarily, and usually exclusively, a mammalogist. Likewise the men in each of perhaps thirty different aspects of natural and social science are likewise specialists, each involved in his own little field.

However, the techniques of cycle analysis are the same whether one is studying biological data or financial data. And—much more important—it is only by studying cycles in all sorts of phenomena, and finding which phenomena have cycles of identical average time span, that we are likely to get hints of cause and effect relationships.

A New Science

These two facts cry aloud for the creation of a new science—the science of cycles—which is concerned with rhythmic fluctuation **per se**, which will develop techniques of cycle analysis, which will isolate cycles in all the 30 or 40 different branches of science where cycles are important, and which, having assembled enough facts, will perhaps someday venture to advance some theories in regard to cause and effect.

The Foundation for the Study of Cycles was created, in 1940, to found such a new science, and to develop it to the point where it could serve mankind. In the eleven years which have elapsed since its creation, the Foundation has made slow but steady progress.

It should be clear from the above remarks that the Foundation is purely an educational and scientific body and in no sense a commercial organization. It exists, not to make money but to serve mankind.

An eminent group of scientists and administrators have lent their names to the Committee of the Foundation. Various scientific societies have appointed advisors to help with its awards, and many individual scientists have joined the Foundation as scientific members. On its part, the Foundation has tried to maintain the high scientific standards of the many universities and institutions here and abroad which are, through their professors, connected with it, and I think we have pretty well succeeded.

So much for background . Now to come to the point of your own interest, which is probably the stock market.

Cycles in Stock Prices

Stock prices as well as many other phenomena, fluctuate in cycles. More exactly, stock prices act as if they were influenced by a number of different cyclic forces, all acting concurrently. As this may be a difficult concept for you to get hold of, let me elaborate, and give you some examples.

The cardiograph record of your heart beats shows a simple rhythm of perhaps 78 cycles a minute. But imagine what it would look like if you had a second heart which beat, let us say, 41 times a minute. Now suppose you had three hearts, one of which beat 78 times a minute, the second 41 times a minute, and the third 22 times a minute. Can you imagine how complicated the chart of your heart beats would become? And, of course, if you had ten or twenty or thirty hearts, each beating at its own special rate, you would have a mixture of ups and downs which would be well-neigh unscrambable unless you knew something about cycle analysis. That is what we seem to have in the stock market.

Or suppose we had a dozen or more moons, all of different masses and all revolving around the earth at different rates. Can you imagine how complicated our tides would be? Of course, knowing the laws of physics, we could work from cause to effect and, knowing the cycles of each of the moons by observation, we could trace their effect in the waters. But suppose the sky were perpetually overcast, like the sky of Venus, and we did not know the moons were there. It would be a long time, I am afraid, before it would occur to anyone that the seemingly haphazard movement of the water was due to anything but the winds. Patient work over many years might be necessary before the mystery could be unscrambled, the various moons postulated with certainly, and predictions made with accuracy.

The same conditions prevail in regard to cycles in climate and in economic affairs. We know that there are cycles in these phenomena, but they are fully as complicated as our pulse would be if we had a multitude of hearts, or the tides would be if we had a multitude of moons.

A Dilemma

I thus find myself in a dilemma. On the one hand I am as reluctant to tell you about any **one** cycle in the stock market as a student of tides in a world with many moons would be to tell you about any **one** cycle in the levels of the waters. On the other hand I do not know enough to tell you about all the cycles all at once. Such a report would involve the expenditure of at least thirty thousand dollars for research. This is a sum which we do not have available for this purpose at this time.

In an attempt to resolve the dilemma in our June report I told you in one article about the 9.2-year cycle in common stock prices and in another article in the same issue I gave you a synthesis of some ten different cycles, each over 4½ years in length, which may be present in the market. This synthesis showed how, **if these ten cycles are present,** they could pretty largely offset and overwhelm the 9.2-year low due at the present time.

In this report I am giving you further details in regard to the ten cycles which made up the synthesis. I am also giving you a complete report in regard to the 19.4 year cycle as it is found in rail stock prices, 1831 forward.

The 9.2-year tendency and the 19.4-year tendency have manifested themselves in the stock market and in other phenomena over so long a period and with such regularity that it is difficult to believe that these cycles are the result of random forces. On the other hand, these two cycles by themselves no more provide an adequate forecast of market behavior than a knowledge of the effect of two moons would provide an adequate forecast of ocean water levels if we had many moons.

Future Reports

In future issues I shall review the original preliminary work in regard to each of the ten cycles to see if I can pin them down more accurately. I shall then make a new synthesis for you using the new values and including any additional cycles which may appear in the course of the work.

Bear in mind that the ten cycles synthesized in the June report are all long cycles. The shortest cycle used is 4.89 years in length. The lengths run from there up to 21 years. However, there are many short cycles in the market also. In 1944 I did preliminary work on these short cycles as well, as I reported in the six-page article on cycles in the stock market published in our March 1951 issue.

When these short cycles are included in the synthesis and the results are plotted on a monthly basis we get a very much more detailed picture than the one presented in June. In a future issue then I shall go over my short-term cycle work to determine wave length, position, and amplitude of each cycle more accurately, and to determine any additional cycles which should be taken into account in order to make a practical projection. I shall report to you in detail in regard to each of these shorter cycles also.

I do not pretend to know what the stock market is going to do. But I do have many facts about cycles in stock market behavior which I should like to share with you,—facts which you need to have in your possession if you are to have an adequate understanding of stock market movements. I shall marshal these facts and present them to you as rapidly as possible. If you will have a little patience I will tell you all that we at Foundation headquarters know about cycles, and all that everyone else knows, insofar as they have made their knowledge public. To this knowledge you can then add your own knowledge and perhaps come up with something of very real value.

Very cordially yours,

Edward R. Dewey

Director

THE SYNTHESIS OF LONG CYCLES IN STOCK PRICES

THE synthesis we printed for you on pages 220 and 221 of the June 1951 report combining ten possible long cycles in common stock prices seems to have aroused a good deal of interest. An additional article on the same subject therefore seems to be desirable.

Work Done in 1943-1944

We gave you the lengths of the component cycles in our March 1951 report (page 88). The synthesis shown in the June 1951 report merely multiplied together all of these cycles over 4½ years in length, using proper phase position and proper amplitude.

May I emphasize again that the exploration which disclosed these patterns was strictly preliminary, and that their synthesis is **not** to be taken as a forecast. The work was printed to show you how other cycles **could**, if real, distort the 9.2-year cycle at the present juncture. From that standpoint it does not matter very much whether the other cycles are real or not. In either event the synthesis serves to illustrate the **principle** of distortion.

In 1943 and early 1944, when the work was done, I attached very little importance to the results. But I must confess that now, after a lapse of seven years, in view of the extent to which the actual behavior during the interval has conformed to the projection, I have more respect for it. But I must still insist that the job was merely a crude reconnaissance and that it must not, without a great deal more work, be used as a guide to future probabilities.

This additional work is now being done. The June 1951 report carried an account of the 9.2-year cycle. The 19.4-year cycle is being reported upon in this issue. During the coming months the other cycles will be reported upon, one by one. When the isolation of the various cycles has been completed and a new synthesis constructed, we may achieve something of value, but for the present we have merely a "mock-up" combining certain waves which may or may not be real and, even if real, may or may not have been accurately determined.

With this warning out of the way, suppose we proceed to the subject of this article—namely an elaboration of the June 1951 article about the 1943-44 synthesis.

The Ten Cycles

The ten cycles are diagrammed in Fig. 1 on pages 246 and 247, and the synthesis is repeated underneath them so that you can see how the various waves combine to produce the result shown.

The lengths, amplitudes, and timing of the ten cycles used in the synthesis are shown in table 1 on page 248.

Note that in all instances the waves have been idealized to a symmetrical zigzag or saw-tooth shape—**not** to a sine shape.

The over-all amplitude represents the sum of positive and negative amplitudes, expressed as percentages from trend.

The timing of the current, past, and future crests can be obtained by working forward or backward from the given crests.

Fig. 1.

TEN POSSIBLE CYCLES IN THE STOCK MARKET AND THEIR SYNTHESIS,

1854-1990

CURVES A to J inclusive diagram ten cycles which were revealed as possibly present in the stock market by a preliminary analysis made in 1943 and 1944.

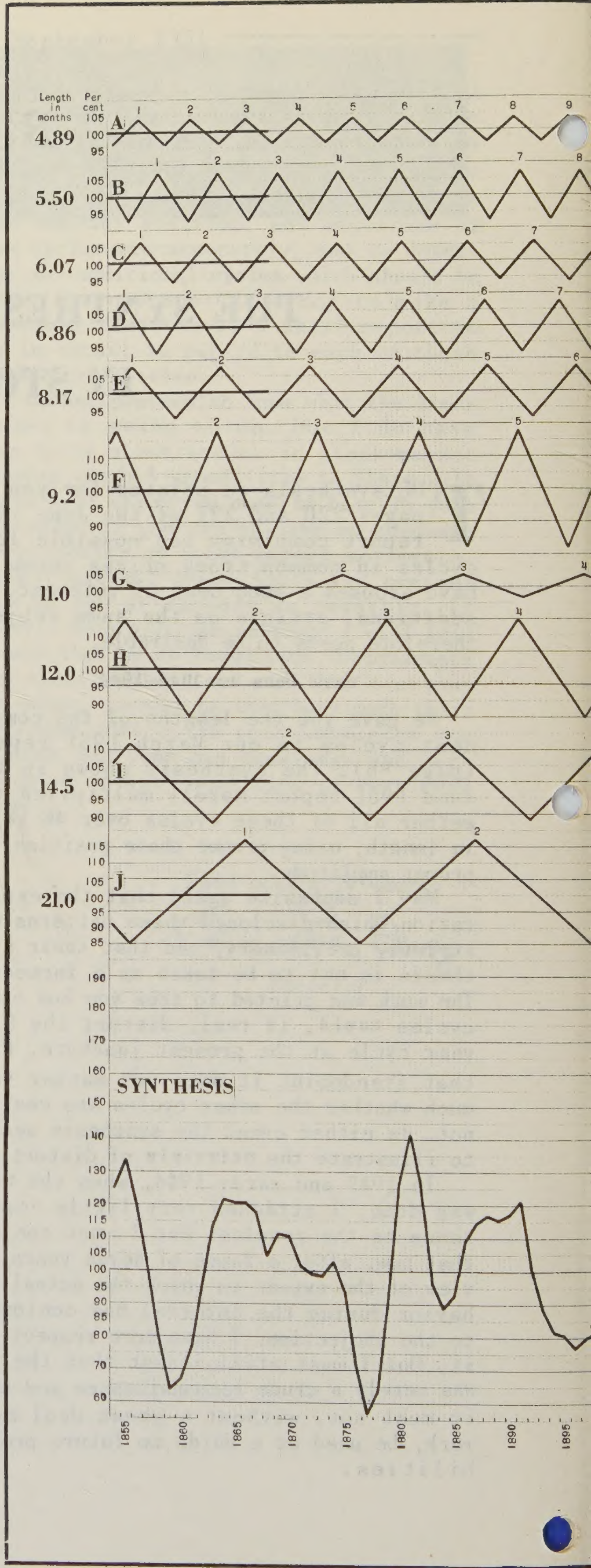
The synthesis shows the combined effect of cyclic forces of these wave lenfths

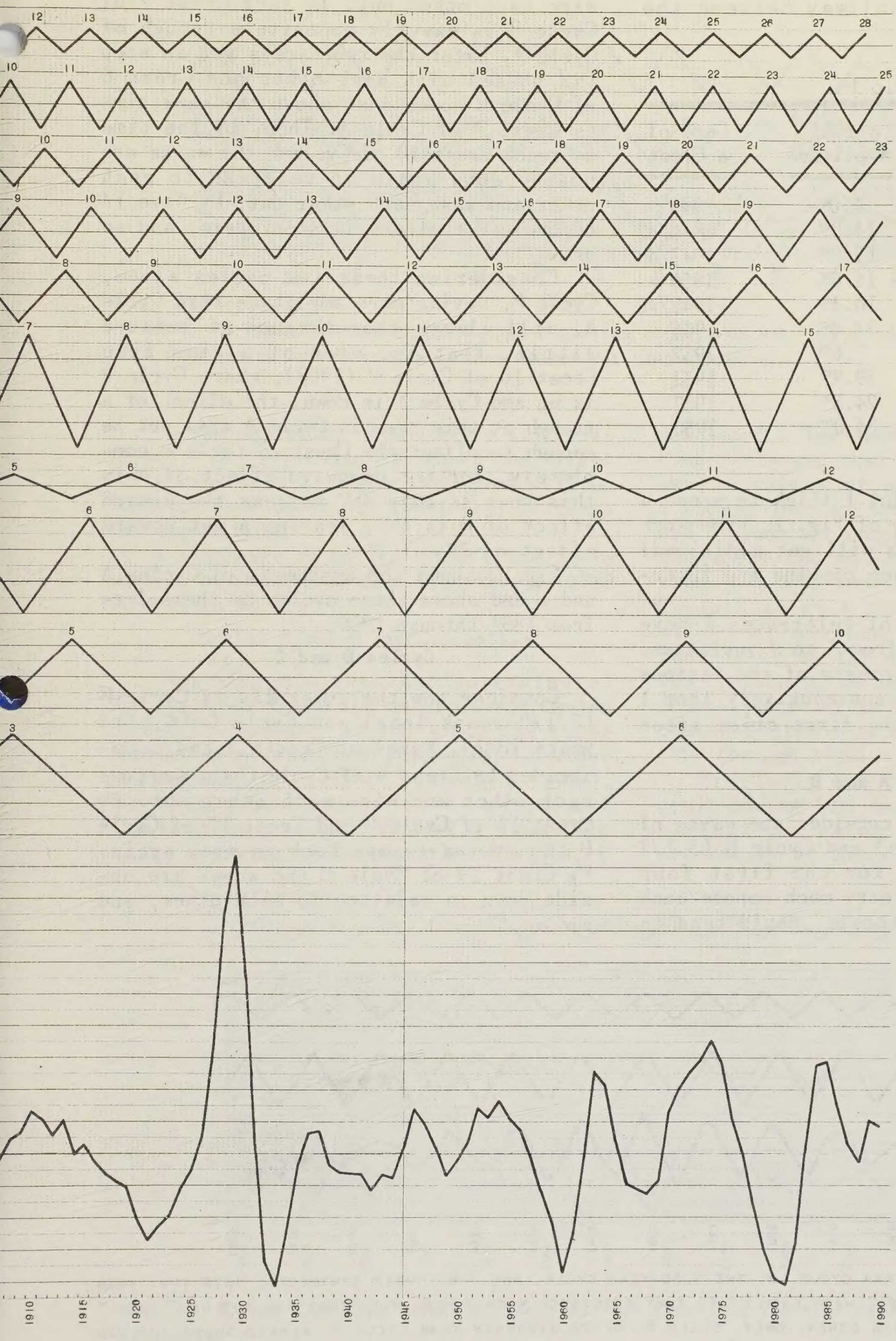
The synthesis shows the combined effect of cyclic forces of these wave lengths, strengths, and timings.

This chart illustrates the principle of cycle combination and shows how any cycle can sometimes be overwhelmed by several other cycles in combination.

The synthesis was compared with actual behavior, 1854-1950, in our June report.

The projection will bear some relation to actual future behavior only if the indicated cycles have been correctly determined as to length, strength, and timing, if they are real, and if they continue.




12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
10 11 12 13 14 15 16 17 18 19 20 21 22 23
9 10 11 12 13 14 15 16 17 18 19
8 9 10 11 12 13 14 15 16 17
7 8 9 10 11 12 13 14 15
5 6 7 8 9 10 11 12
6 7 8 9 10 11 12
5 6 7 8 9 10
3 4 5 6
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990

Lows are exactly halfway between the highs.

Table I

Cycle	Wave Length	Overall Amplitude	Date of a Crest
A	4.89 years	7.0%	1949
B	5.50 "	14.0%	1946/47
C	6.07 "	12.0%	1947/48
D	6.86 "	16.6%	1950
E	8.17 "	16.4%	1945/46
F	9.2 "	34.4%	1946
G	11.0 "	7.6%	1952
H	12.0 "	30.2%	1951
I	14.5 "	24.5%	1957
J	21.0 "	34.0%	1950

It will be fruitful I think to spend a few moments in study of Fig. 1. From such study you and I both will get additional knowledge of how waves combine and interact with each other.

For convenience of references I have lettered the cycles from A to J inclusive. I have numbered the crests of the various waves of each cycle consecutively from 1 up, starting with the first crest after 1854.

Cycles A and B

Suppose we first consider the waves of Cycle A (4 8/9 years) and Cycle B (5 1/2 years). Note that for the first four waves these waves pretty much oppose each other and, in a synthesis, would tend to wipe each other out. In fact Crest 2 of Cycle B is exactly opposite a trough of Cycle A. Later the two cycles get in step (in phase) with each other and Crest 6 of Cycle B comes just about the same time as Crest 7 of Cycle A. Then, by the time we reach Crest 10 of Cycle B the waves are upside down again in relation to each other and wash each other out. By Wave 14 of Cycle B they are in step again, and so on.

Considering these two cycles alone, Cycle B, having more amplitude than Cycle A, will always show through at least a little. That is, even at a time like Crest 10 of Cycle B (1908), where Cycle B is up and Cycle A is down, the effect of a trough at this time in Cycle A will not be enough to offset the Crest of Cycle B completely, for the downward effect of A in this year is only 3½% whereas the upward effect of B is 6½%, leaving a net upward effect of 3%.

Fig. 2 shows the synthesis of Cycles A and B and shows these cycles by themselves from 1854 through 1920.

Cycles B and C

Consider now the interplay of Cycle B (5 1/2 years long) and Cycle C (6 1/14 years long). Waves at Crests 4 and 5 coincide. By Crest 9 of Cycle C they oppose each other and wipe each other out. By Crest 14 of Cycle C and Crest 15 of Cycle B the two waves are back in step again. By Crest 19 of Cycle C the waves are upside down in relation to each other, and so on.

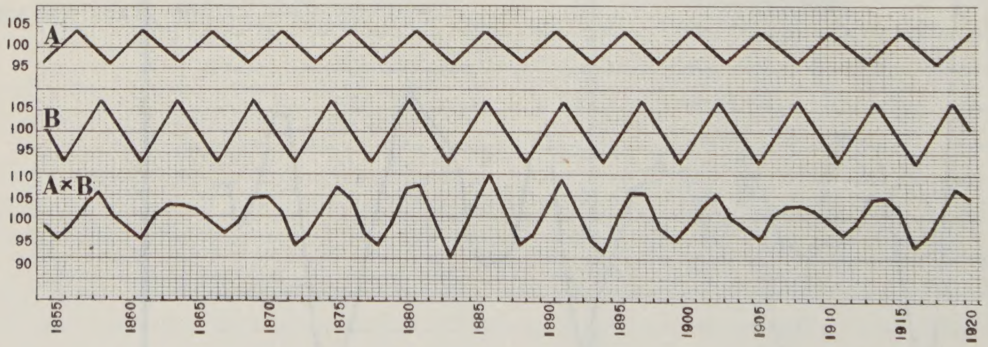


FIG. 2. A, THE 4.89-YEAR CYCLE, B, THE 5.50-YEAR CYCLE, AND A×B, THEIR SYNTHESIS. NOTE THAT WHEN THE WAVES ARE " IN STEP " WITH EACH OTHER THEY REINFORCE EACH OTHER. WHEN THEY ARE OUT OF " STEP " THEY TEND TO OFFSET EACH OTHER, ONLY, CYCLE B, BEING STRONGER THAN CYCLE A, ALWAYS SHOWS THROUGH AT LEAST A LITTLE.

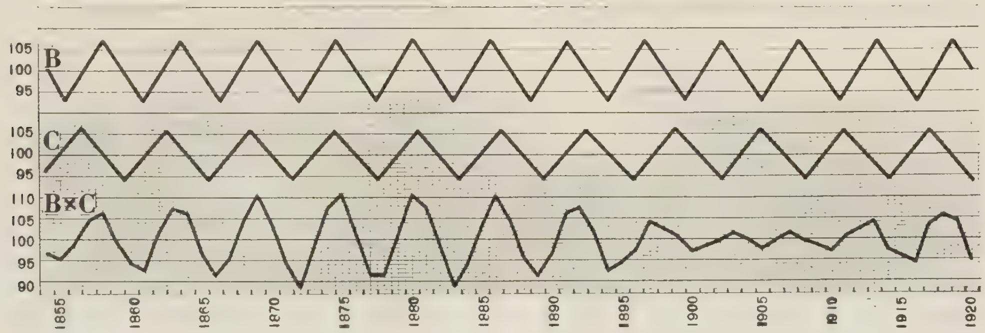


FIG. 3. B, THE 5.50-YEAR CYCLE, C, THE 6.07-YEAR CYCLE, AND B×C, THEIR SYNTHESIS. THIS CHART SHOWS THE COMBINATION OF TWO CYCLES OF MORE NEARLY THE SAME STRENGTH.

As the amplitude of the waves in Cycles B and C are approximately equal the effect of a synthesis of these two waves will be to wipe each other out completely at times of opposition.

A synthesis of Cycles B and C and these cycles by themselves from 1854 through 1920 are shown in Fig. 3.

Cycles A and B and C Together

You have now seen the interplay of Cycles A and B and the interplay of Cycles B and C. However, as you know, all these cycles enter into the synthesis. Consider a time such as Crest 10 of Cycle B (1908). At this time Cycle B is at crest and Cycle A at trough. You will remember that, speaking of Cycles A and B alone, I mentioned a few moments ago that as Cycle B was stronger than Cycle A it would prevail at this point and that there would be a crest. That is true as far as Cycles A and B alone are concerned and, as you will remember, the net upward effect at this time was 3%. But in this year (1908) Cycle C is at a trough with a downward effect of 6%. The net result for 1908 therefore, as far as these three cycles are concerned, is downward by 3%. In this connection refer to Fig. 4 which shows the combined effect of Cycles A and B and C, 1854 through 1920.

Similarly one could go on cycle by cycle adding (or, more accurately, multiplying) the waves together, to arrive eventually at the synthesis shown at the

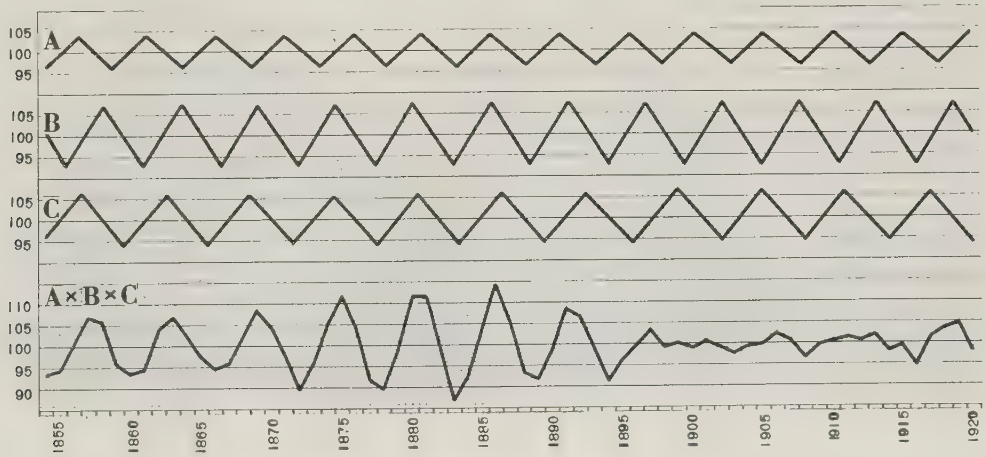


FIG. 4. A, THE 4.89-YEAR CYCLE, B, THE 5.50-YEAR CYCLE, C, THE 6.07-YEAR CYCLE, AND A×B×C, THEIR SYNTHESIS.

bottom of Fig. 1.

Two or three matters are of interest at this point.

Any Curve can be Reproduced by Combining Cycles

One thing that should be pointed out is that with the right choice of cycles sometimes reinforcing each other and sometimes offsetting each other, you can obtain a synthesis which will reproduce any pattern whatsoever. The fact that the **synthesis** corresponds to the past behavior of the series therefore, by itself, testifies to nothing except your ingenuity. You must determine the reality and the significance of each cycle separately.

Great Accuracy Needed in Cycle Analysis

A second point to make is that any error in determining wave length is cumulative. Suppose for example that the waves of Cycle A were really 4 7/9 years long instead of 4 8/9 years long. Under these circumstances the waves would be correctly placed in the middle of the span from 1854 to 1943—let us say at about 1898. But one wave in either direction from the center the diagrammed wave would get 1/9 of a year out of step with the true wave; two waves and it would be 2/9 of a year out of step, and so on. By 1953 the crest of the real wave would be more than a year or almost a quarter cycle before the crest of the wave as diagrammed—in other words the real crest would be at a time when the diagrammed wave would be at a node and would show no effect at all! Eventually, the synthesis would show a crest where the real wave would show a trough, and the forecast, insofar as the effect of this one wave was concerned, would be upside down. This fact shows the need for great accuracy in cycle length determination.

Cycles Combine to Produce Repeating Patterns.

The third point I wish to make deals with the fact that cycles which may appear in the original curve, or in the synthesis, may be the result of combination of other cycles. For example, there is an 18 1/3 year pattern present in the synthesis with lows at 1859 (on time), 1877 (on time), 1896 (on time), 1921 (7 years late, low due in 1914), and 1932 (on time). Yet there is no 18 1/3 year wave used in the synthesis at all. The effect is the result of the combination of three 6 1/14 year waves, and two 9 1/5 year waves. As three 6 1/14 year waves are 18.214 years long and two 9.2 year waves are 18.4 years long the two will eventually get out of

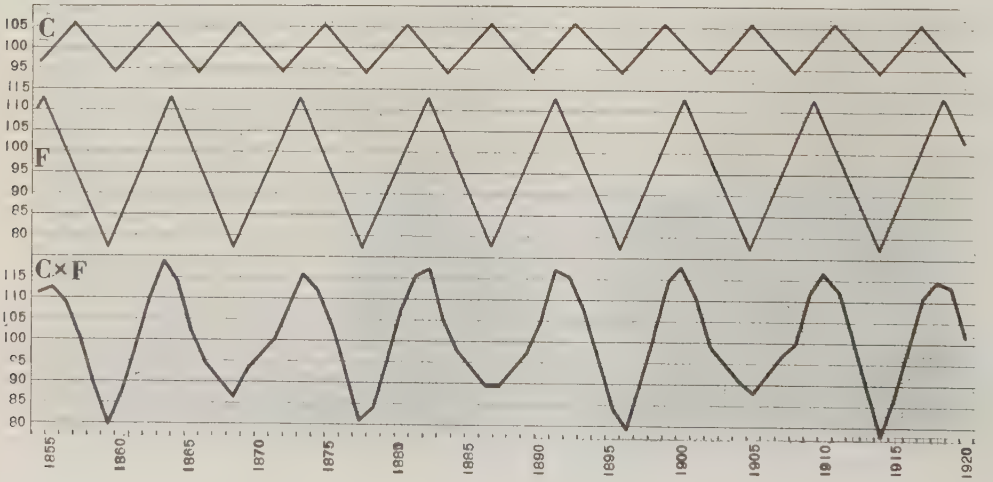


FIG. 5. C, THE 6.07-YEAR CYCLE, F, THE 9.2-YEAR CYCLE, AND C×F, THEIR SYNTHESIS.

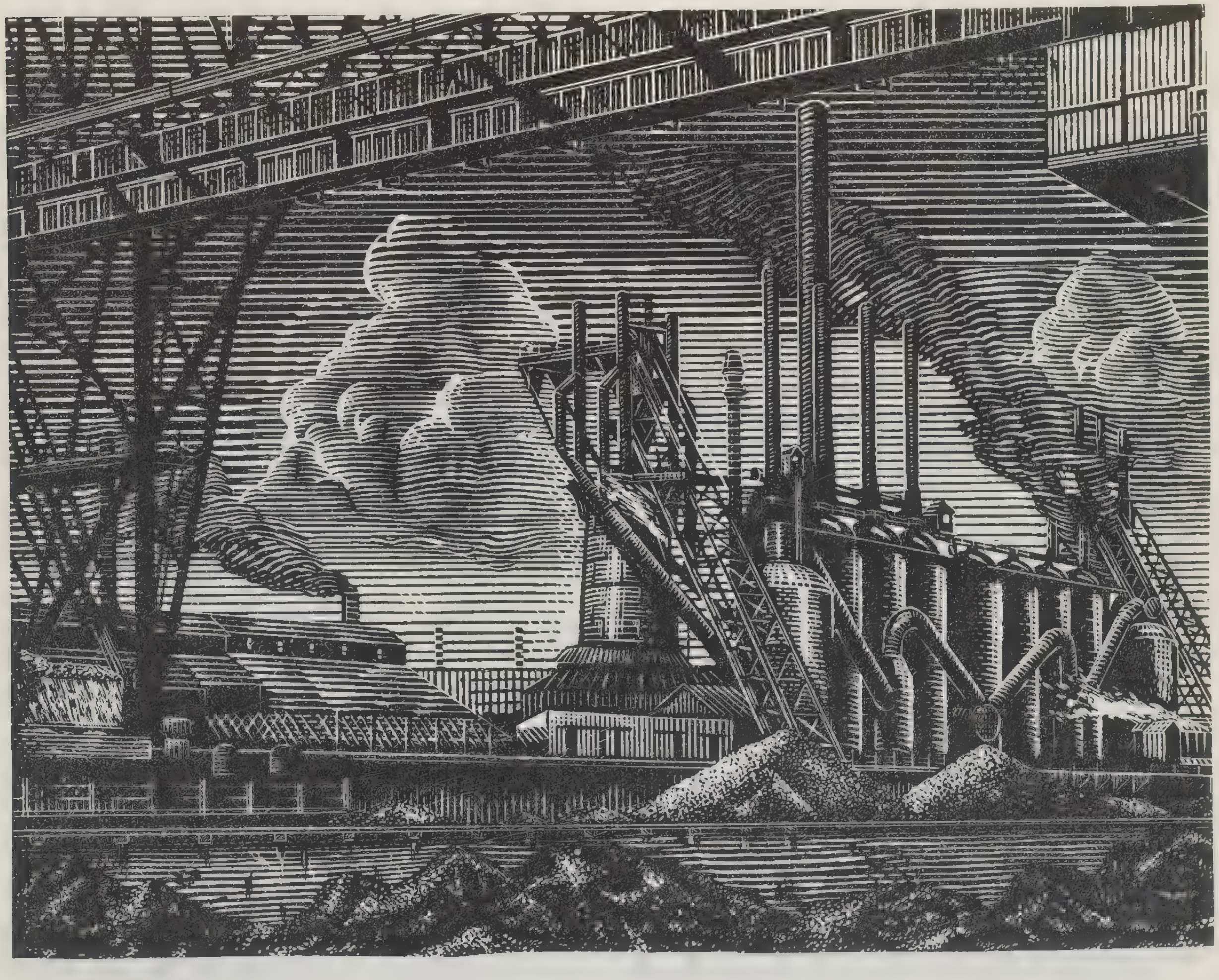
step and the 18 1/3-year pattern will vanish, but not for a very long while. The composite effect of the 6 1/14 year cycle and the 9 1/5 year cycle is shown in Fig. 5 on page 250.

A fourth point is raised by the illustration just given.

Cyclic Patterns Often Overwhelmed

As the 18 1/3 year tendency can be expected to continue for a long time, you would expect the synthesis to show especially deep lows in 1951, 1969, 1987, etc, but this does not prove to be the case. The first major low of the synthesis, after 1932, is in 1960 and the next one is in 1987. In other words you have what seems to be the 18 1/3 year cycle almost in reverse.

The answer is, of course, that the 18 1/3 year low due in the synthesis in 1951 has been wiped out by other waves, as it was in 1914. The 18 1/3 year tendency does show clearly in 1968 (1 year early), and in 1888 (1 year late), but it is completely overshadowed by the combined effect of other waves in 1960 and 1981. This fact illustrates again that one must know all the cycles before one has much of anything upon which to go.



Blast Furnace Making Pig Iron

A 9-year cycle in pig iron prices was first discovered about 1870. It has continued from discovery up to the present. This fact would seem to establish its reality. It seems to be the same cycle as the 9.2-year cycle present in common stock prices.

Synthesis Only Preliminary

And finally, remember that in this entire article I have been talking with you about the behavior of the **synthesis**, not of the actual stock market. The actual market will behave this way only to the extent that the isolated cycles are real and continue, have been correctly determined, and dominate over accidented variation. Remember this analysis was only a preliminary reconnaissance, engaged in merely as a guide for more accuract work to be done later. Only a few of the waves have actually been verified. And some of the wave lengths may be wrong. For example I suspect that the cycle shown as 11 years is really 11 1/5, that the cycle shown as 12 years is really 12 1/2 years, and that the cycle shown as 21 years may be the well known 22 1/5 year cycle. All such matters will be resolved in the course of time.

In the mean time keep in mind that if Mr. Ford were to show you a wood and plastic mock-up of his new 1952 car you would not expect to be able to get in it and take a ride. You would wait for him to build it over with copper and rubber and steel. Similarly you should not use my little mock-up of some waves which may or may not be real as a reliable guide to the future. Content yourself for the moment with using my work to understand principles and to get an idea of the sort of thing that can perhaps be done with assurance when we know enough.

Indian Corn

The prices of corn, like the stock market prices, are characterized by a cycle about 5½ years in length. First discovered about 1872, this cycle has continued since discovery. It would seem to be real.

Sunspots Before 1750

I was particularly interested to receive the other day from Mr. D. Justin Schove, Principal of St. David's College, Kent, England, a reprint from the **Journal** of the British Astronomical Association containing a transcript of his remarks before a recent meeting. These remarks are printed below.

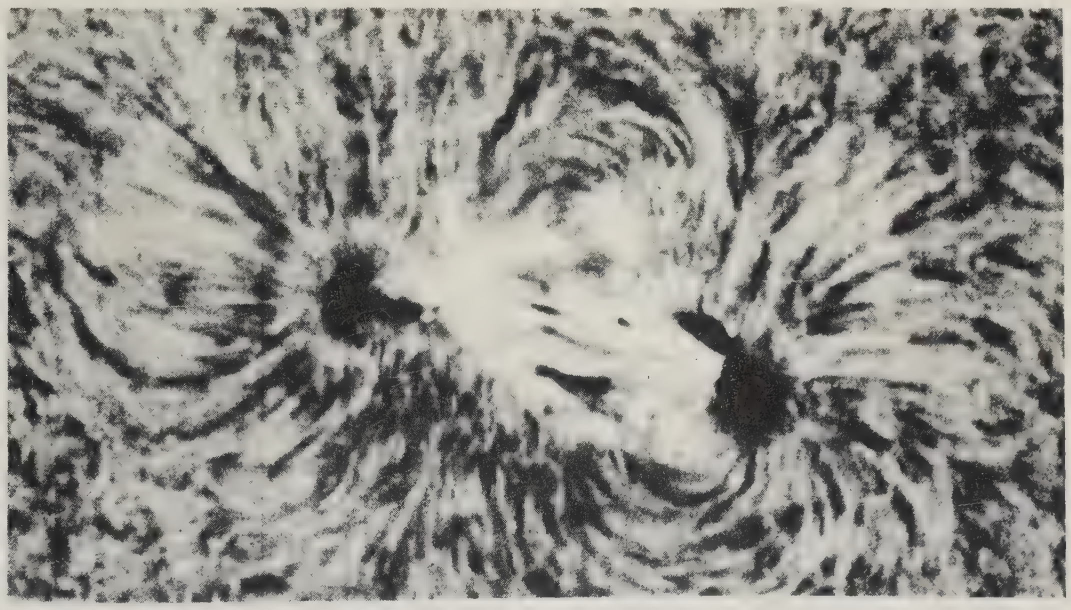
My interest is everything pertaining to sunspots results from the very great importance I attach to these phenomena from the standpoint of cycle study.

There are very few phenomena here on earth which fluctuate in the traditional 11-year sunspot cycle, but sunspots also act as if they were influenced by rhythmic forces other than the well known cycle of 11-years. This situation is particularly true if we follow the stroke of genius of C. N. Anderson of the Bell Telephone Laboratories and reverse or turn upside down alternate sunspot cycles. In these figures so reversed we find evidence of the 17 2/3- and 18 1/3-year cycles, the 14 2/3 year cycle, the 6-year cycle, the 22 1/5 year cycle, the 3-year cycle, the 12 1/2-year cycle, and many other cycles which are a commonplace here on earth. There is a physical justification for the reversal in that the polarity of alternate cycles reverses.

Is the sun the cause of these various long term cycles or waves which we observe on earth, just as it is the original cause of the various terrestrial light waves? Or are the cycles we observe in the sun and the corresponding cycles on earth the result of forces external both to the sun and to ourselves? As yet we are not in a position even to conjecture, but there is abundant evidence to suggest some interrelationship, either direct or indirect, even if we do not yet understand either the mechanism or the cause.

Anything therefore which we can discover to piece out the rather meager data now available, and extend them backward over the centuries, is of the greatest possible interest. In consequence it is a real pleasure to learn of the progress of Mr. Schove's research, as reported in the excerpt referred to above, which reads as follows:

" Mr. D. J. Schove then addressed the meeting on his paper 'The Earliest Dated Sunspot.' [**Journal B.A.A.**, 61, 22, 1950 December.] He said: In 1948 I referred to the Spectrum of Time as a list of the dates of comets, aurorae and other astronomical and meteorological phenomena. [**Journal**, 58, 178-190, and 202-204, 1948, June and August.] Since 1948 much help



A SUNSPOT GROUP, AUGUST 30th, 1924 *Courtesy of Mt. Wilson Observatory, Pasadena, Cal.*

has come, both from members of the Association and from different parts of the world. As this information is assembled, the descriptions begin to take on a new look.

"Early records of naked-eye sunspots are a by-product of this more general study. Lists of years when sunspots were seen in Britain or Europe (before 1610) have already been published by Humboldt, Secchi and others; it is now necessary to find and translate the original sources. The 'black spot on the Sun' has in some of the cases usually quoted proved to be not a sunspot but the Moon—for the date is that of a calculated partial eclipse! At other times the spot is genuine but the date is difficult to determine. In any case, although Theophrastus had talked of 'spots on the Sun and Moon', Aristotle's Sun was a celestial and therefore perfect body and it became seditios to suggest that it could have such things as spots. Both Arab and Christian astronomers assumed therefore, that any spot they saw must be Venus or Mercury in transit across the Sun. Even Kepler made that mistake in 1607, just before the telescope appeared on the market. Sunspots had often been noticed in hazy weather, and the newspapers were not the first to blame on them the bad weather received on Earth. In England the tradition goes back at least to Digges, in Tudor times.

"Russian accounts of sunspots seen through the haze curtain of a forest fire include the description of these in 1371, when the Sun appeared 'as if nails were driven into it'. Korean astronomical observations exist from A.D. 300, but no copy of the early observations is as yet available in this country. From at least A.D. 1151 there are various references to sunspots, which have been extracted by Kanda.

"The best series of sunspot records come from China. The earliest dated sunspot might well be the character for 'prince' seen in the Sun in 165 B.C. A group of spots at that time might well have been taken as a Chinese character divinely inscribed on the Sun. The suggestion seems less far-fetched when the evidence for aurorae in the same year is considered. A 'yellow dragon' and a 'supernatural emanation in five colours' were seen in the same year, and these visions may well have been aurorae associated with the same sunspot maximum. Roman displays and the tree-ring-pattern of Californian trees (supposed to reflect the sunspot cycle) fit in vaguely with the idea of a sunspot maximum near 165 B.C., but further investigations are needed.

"Chinese records of sunspots were quite definite from 28 B.C., when one 'as large as a coin' was seen in the Sun. Another in A.D. 20 may have been associated with the aurora (at Rome) which the fire-brigades of Tiberius attempted to extinguish! One in A.D. 187 was 'as large as a gourd' and another the next year 'like a flying bird'. After about A.D. 300 there are many Chinese observations of sunspots, which are variously compared to flying-birds, eggs, apples, pears, plums and other objects. The Early Indian records refer to snakes fighting in the Sun.

"Many more early sunspots and aurorae could be identified in chronicles from different parts of the world. Some examples for the period A.D. 400-600 are being discussed an a forthcoming paper ['Visions in North-west Europe (A.D. 400-600) and Dated Auroral Displays', **Jnl. Brit. Archaeol. Assn.**, 1951.] where it is shown that many religious visions are sincere attempts to describe auroral forms. It is also shown that well-defined maxima occur near the following years:...430, 441, ... 479, 490, 500, 511, 522, 532, ...555, 566, 577, ...643, 655, 664, etc., roughly confirming the rule that the last two digits follow the eleven times table in these early centuries.

"The great need for continuation of this work is for collaboration from those able to translate chronicles (especially oriental ones). There are mysterious portents even in Babylonian times which might be interpreted as sunspots. There are in the religious literatures of the world many dated visions of astronomical or meteorological significance. Much new information is already becoming available on early comets, meteors and other phenomena. Further collaborators on this Spectrum of Time project would be very welcome."

The 19.4-Year Cycle in Railroad Stock Prices

FOR the past 120 years there has been a very important cycle in railroad stock prices which averages 19.4 years from crest to crest and from trough to trough. That is to say, a rigid or perfectly regular pattern of 19.4 years in length fits the observed behavior more exactly than any other perfectly regular pattern you could select. Next to trend this cycle is probably the most important characteristic of railroad stock prices.

My own feeling is that the observed behavior is the result of forces of lengths other than 19.4 years which have combined to produce waves of this length, and that therefore the cycles will not continue to be 19.4 years long. However, until proved, " feelings " have no place in a discussion of this sort, and in the mean time we must take facts as we find them.

Characteristics of the Cycle

The typical 19.4-year wave in railroad stock prices has an over-all height or amplitude of 55.9 % of trend. That is, it runs from 31.8% above trend to 24.1% below trend. From trough to crest prices increase on the average by 73.4%, or 5.8 % per year for each of the 9.7 years of rise.

The typical timing puts the next trough ideally at 1956 and the next crest ideally at 1966, but of course the dates of actual high and actual low are likely to be quite different, due to the distorting effect of other cycles and of non-cyclic events.

Railroad stock prices are available from 1831 to date. The Standard and Poor's Corporation Rail Stock Index has been extended back to 1871; figures prior to that time come from the Cleveland Trust Company index, suitably adjusted to be comparable. These figures are charted in Fig. 1, which shows actual values on one scale and logarithmic values on the other.

Trend of Railroad Stock Prices

As can be seen at a glance, in contrast to industrial stock prices which were charted for you from 1871 in the April 1951 issue on pages 144 and 145, the trend of railroad stock prices cannot be described by a straight line fitted to the logarithms of the prices. Rail stock prices are like Napoleon's men in the jingle. They " marched up the hill and then marched down again. "

In other words, the trend goes first up and then down as shown by the broken line in Fig. 1. (For details as to the construction of the trend, and other details of technique, all set out in sufficient detail so that any statistician can duplicate the work described herein, you are referred to the Technical Section of this issue on page 263.)

Cycles Shown as Percent of Trend

The 19.4-year waves can be seen more clearly if we express the data as percentages of trend, as in Fig. 2. In this chart the trend has been "pulled straight" as it were, and the curve shows merely the amount by which the actual values are above or below trend. To diagram the

Fig. 1.

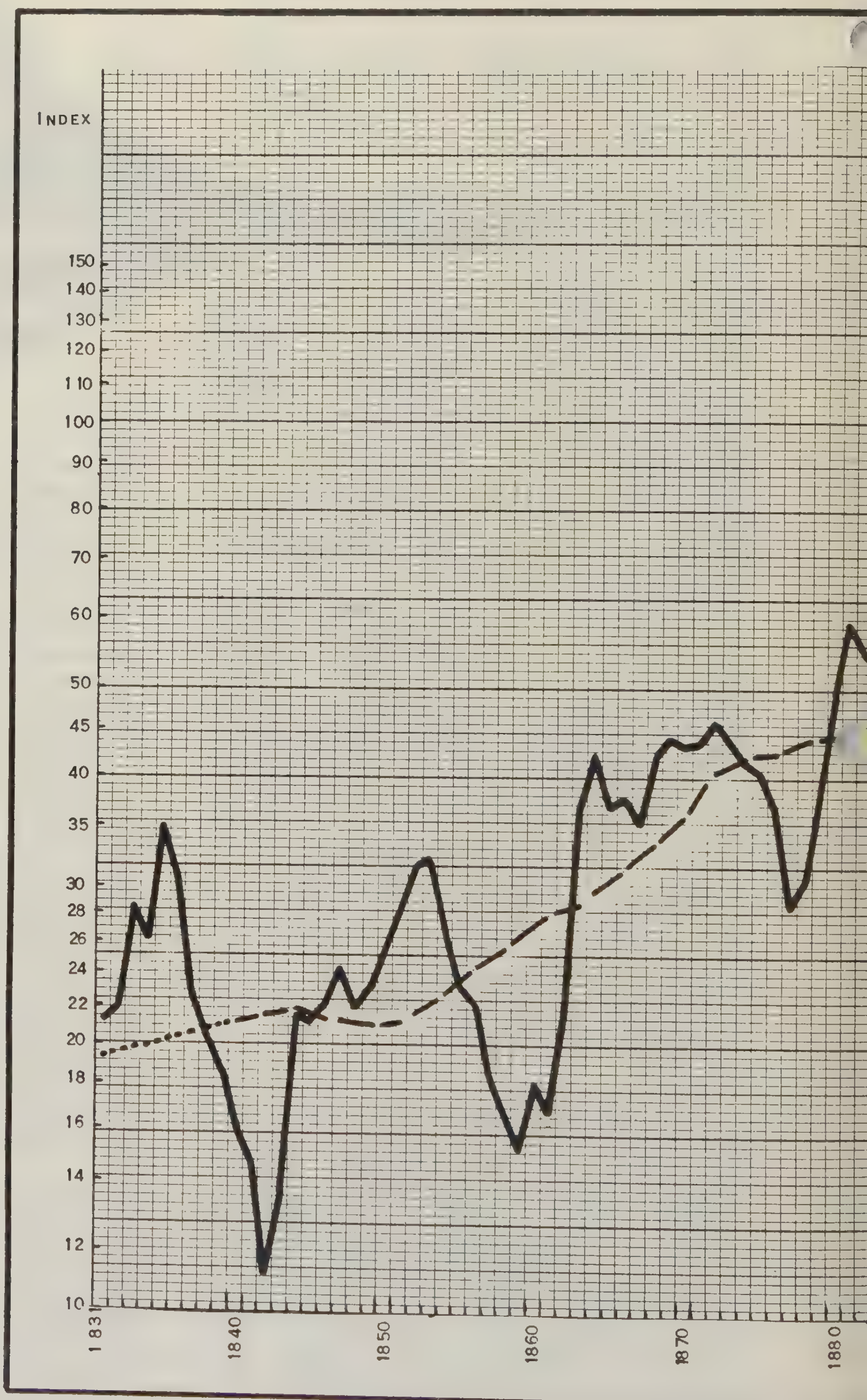
RAILROAD STOCK PRICES, 1831 – 1950

The solid line shows the course of railroad stock prices for the past six generations. The general trend was upward from 1831 to 1910 and has been generally downward since about that time. This behavior is in contrast to industrial stock prices, the underlying trend of which has been continuously upward.

Note particularly the 19.4-year cycle which can be seen easily by inspection. The 19.4-year cycle does not seem to be present in industrial stock prices, or at least not to an important extent.

The broken line represents a 19-year moving average trend. As a 19-year moving average lacks the first and the last nine values these have been added arbitrarily by a dotted line.

Until later in the analysis we cannot tell whether or not the trend has continued to go down since 1940, or has leveled off.



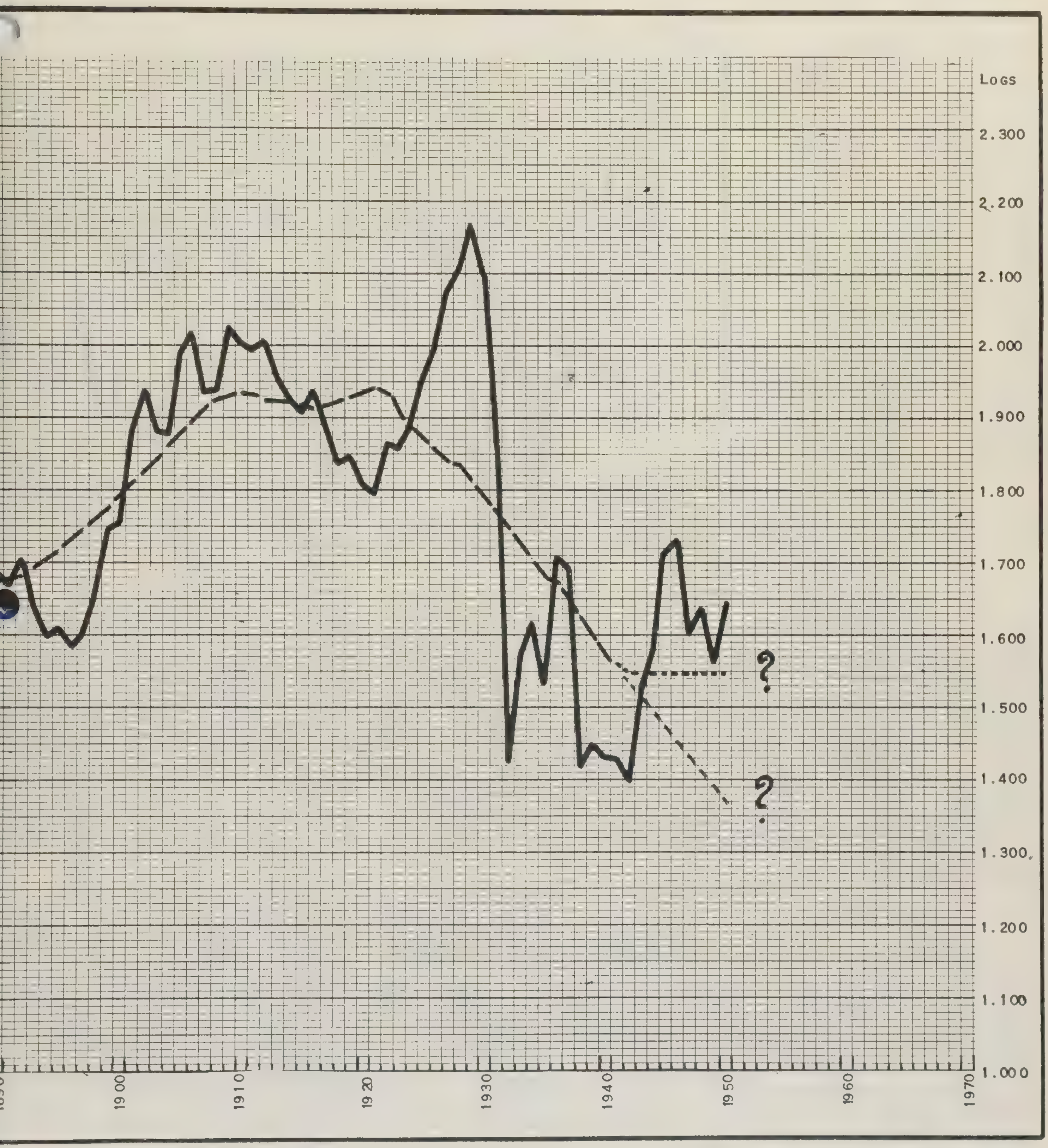

Logs
2.300
2.200
2.100
2.000
1.900
1.800
1.700
1.600
1.500
1.400
1.300
1.200
1.100
1.000
1900
1910
1920
1930
1940
1950
1960
1970
?
?

Fig. 2.

This curve shows railroad stock prices as a percentage of trend. That is, this curve represents the values plotted in Fig.1 corrected for trend.

By eliminating trend from the figures you are able to see the 19.4-year cycle more clearly. To aid your eye I have added, by means of a broken line, an ideal 19.4-year cycle. This ideal cycle has been projected into the future to show the general course of railroad stock prices as a percentage of trend, if this cycle continues.

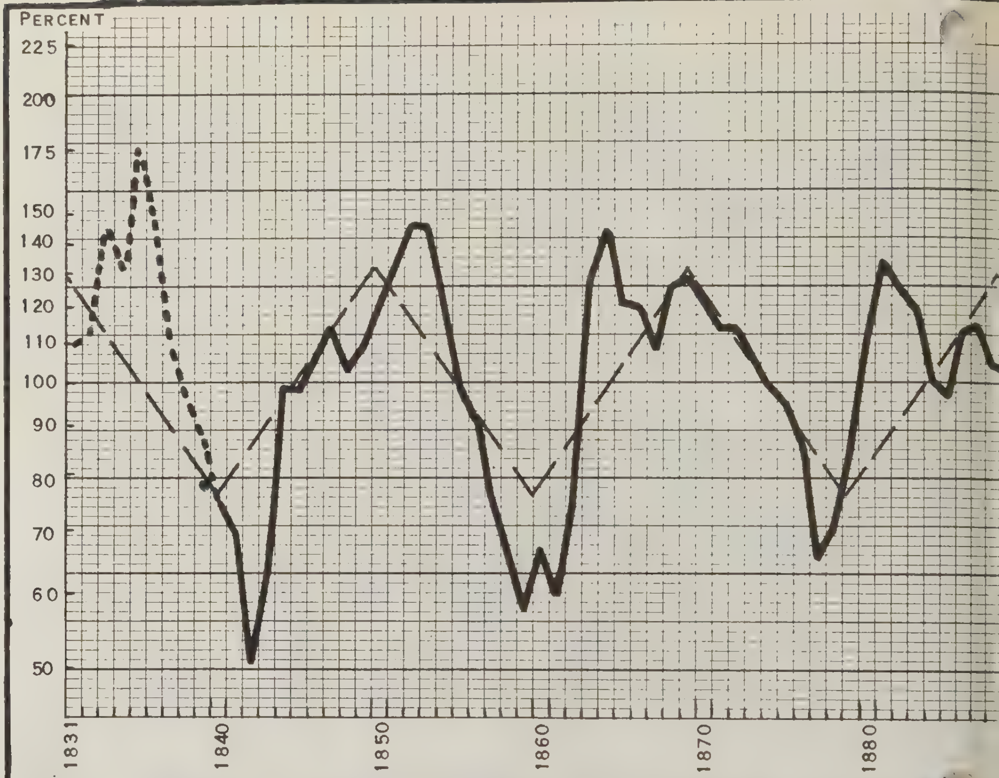


Fig. 3.

This chart shows the figures charted in the upper curve smoothed by means of a 9-year moving average. This smoothing eliminates the 9-year cycle also present in these figures, and enables you to see the 19.4-year cycle more clearly.

Here also I have added a series of ideal 19.4-year waves to guide your eye.

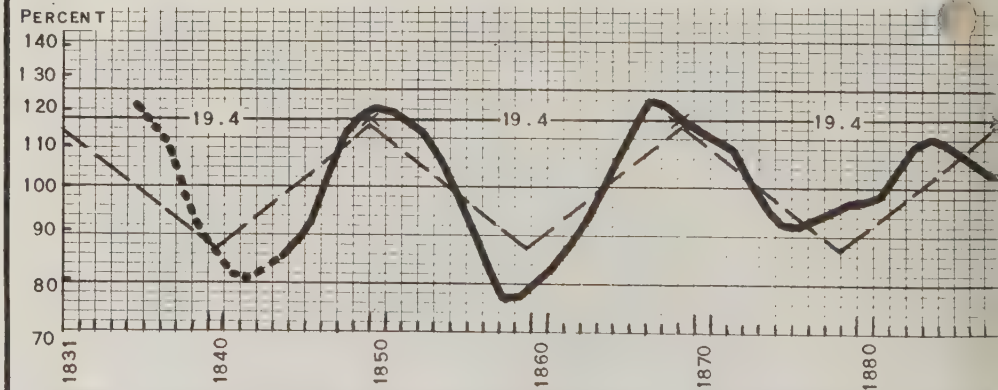
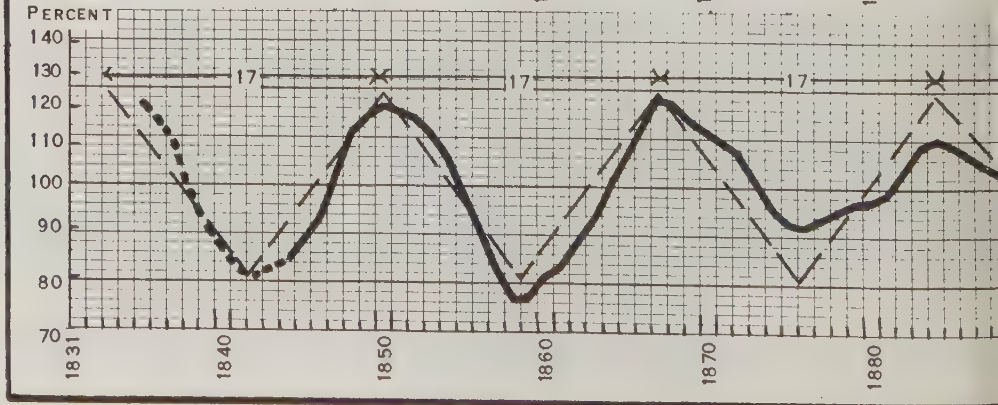


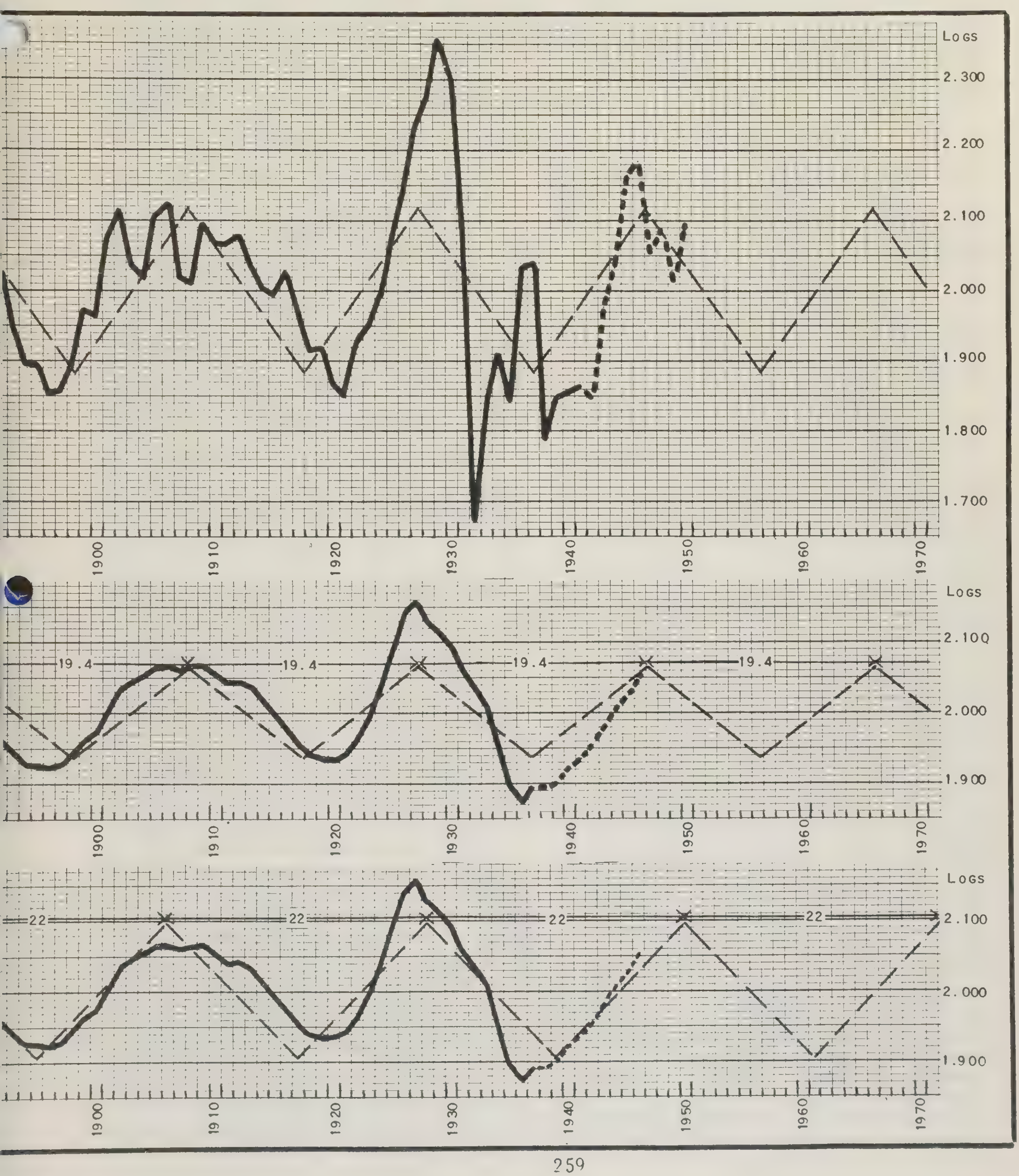
Fig. 4.

The solid line in this figure is the same as the solid line in Fig. 3, but the idealized waves are 17 years long from 1831 to 1885 and then 22 years from 1885 forward.

The fact that the waves seem to change their length suggests the possible concurrent presence of other cycles.



RAILROAD STOCK PRICES, 1831-1950



cycle a 19.4-year zigzag has been added by means of a broken line. This broken zigzag line represents the typical or average 19.4-year cycle as it has shown itself in the past. It has been projected into the future to indicate the future course of the cycle if it continues.

If you will study Fig. 2 you will see what looks to be a recurring cycle of about 9 years in length. We will study this cycle later, but for the present let us eliminate its distorting influence by smoothing the figures in Fig. 2 by means of a 9-year moving average. (Again, for details see the Technical Section.) This smoothing process gives us Fig. 3 where a series of waves which average 19.4 years in length are clearly evident to the most cursory examination.

In passing it is interesting to note that a similar study of industrial stock prices, on which I shall report to you at a later time, shows little or no evidence of waves of this order of magnitude. That is why industrial series and railroad series cannot be spliced together for cycle study, and why the analysis of industrial series cannot use figures prior to 1871, unless trustworthy industrial stock prices can be obtained prior to that date.

What is the Significance?

There is absolutely no question but that there has been a series of waves in these figures and that these waves or cycles average 19.4 years in length. There is however the very important question of whether or not the observed behavior will continue. That is, the question of significance still remains to be answered. Are these six waves in the smoothed data from 1831 to date the result of some basic underlying force which may be expected to continue, or are they the result of six separate and unrelated forces which just happened to come at time intervals which average 19.4 years apart?

As yet no one knows the answer. However as a matter of common sense and reasonableness it would be unusual to find in a series of figures as much regularity of time span and amplitude merely as a result of random forces. As a practical matter therefore, these facts put you on notice that this behavior may continue, and must be looked out for.

Is Observed Cycle Simple or Compound?

Assume for the moment that the observed behavior is not the result of six separate unrelated upsurges but that there is something more than pure chance behind the regularity of the fluctuation. The question arises as to whether they are the result of one rhythmic force with a period of 19.4 years from crest to crest or two or more rhythmic forces which have combined over a brief period of time to form waves of 19.4 years; for example one or two cyclic forces a little over 19.4 years and one or two a little under 19.4 years, perhaps one of them the 18 1/3-year cycle so well known in real estate, construction, and other activity. My own conjecture is that the latter is the true answer.

If you look carefully at Fig. 3 you will see that the first three cycles can be very neatly described by a perfectly regular 17-year cycle, the last three cycles by a perfectly regular 22-year cycle. This behavior is illustrated in Fig. 4.

Does this fact have any significance? To me it does. It suggests again that the observed fluctuations may be the result of three interacting cyclic forces, and that it may be necessary to determine all of these forces before a satisfactory and trustworthy forecast can be made. Before this can be attempted however, it will be necessary to isolate and remove the various shorter cycles. This will be done and reported upon in subsequent issues after which we will return to the problem of the 19.4-year behavior to see if we can throw any more light upon it and upon the probabilities of the future.

Of course you must realize that in a series of figures as short as this, relative to the length of the waves being discussed, an attempt to separate several cycles of more or less the same general length is little more than fancy guessing, but even so it may be worth attempting at the proper time.

In the meantime we can use 19.4 years as the closest possible approximation to any uniform single pattern which could be fitted to the observed behavior.

Technical

TECHNIQUES INVOLVED IN THE SYNTHESIS OF TEN POSSIBLE LONG CYCLES IN STOCK PRICES.

ONCE the various cycles have been determined the synthesis is merely a matter of multiplication. Each cycle has a percentage value for each year. The synthesis is merely the multiplication, for each year, of these various percentages. Simple, isn't it?

Let us start at the beginning with the shortest cycle used, Cycle A; with a length of 4 8/9-years from crest to crest. This cycle was determined to have an overall amplitude of 7%. That is to say it runs from 3 1/2% above trend to 3 1/2% below trend and back up to 3 1/2% above trend again, over the course of 4 8/9 years.

A crest comes exactly at 1876.

(Amplitude, cycle length, and timing are given as they were determined in the preliminary work of 1944. More elaborate analysis might change the values, but would not affect the principles.)

Here is a chart of the ideal wave as defined above:

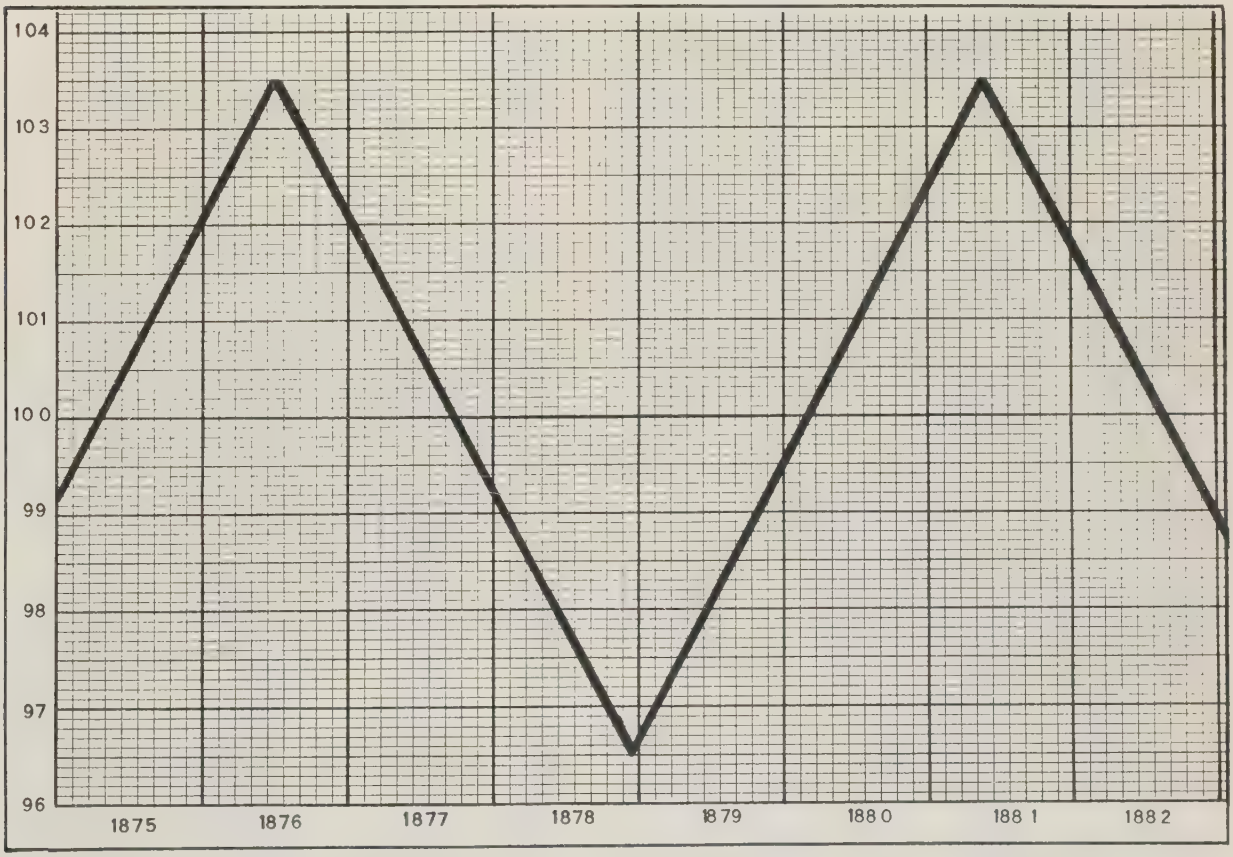


FIG. 1. DIAGRAM OF THE AVERAGE OR "IDEAL" 4 8/9-YEAR CYCLE IN COMMON STOCK PRICES PLOTTED FOR THE PERIOD 1875-1882. THIS WAVE RUNS FROM 103½% OF TREND AT CREST DOWN TO 97½% OF TREND AT TROUGH.

To make it easy for you I have drawn the chart to a large scale, and have put 9 vertical lines per year.

As a crest comes at 1876 you plot the value for this crest in the exact middle of the year at 103 1/2% of trend (+3 1/2%). The next crest would come 4 8/9 years later. The wave being symmetrical the low would come 2 4/9 years after the crest at 96 1/2% of trend (-3 1/2%).

From the chart you can read the values of this wave at the mid-point of each year as follows:

1876	103.5%
1877	100.6
1878	97.8
1879	98.1
1880	101.0
1881	103.1

Or more accurately (and more easily), you can figure it out by arithmetic. The wave goes down 7% in 2 4/9-years (4 8/9 ÷ 2 = 2 4/9), or 7 ÷ 2 4/9, or 2.863636% per year, or .31818% per 1/9th year.

In this way you can proceed forward and backward from 1876 and get the value for each year for a thousand years each way if you wanted to.

As the wave is 4 8/9 years long it will drop back 1/9 year per cycle. In nine cycles it will drop back a whole year to a total of 44 instead of 45 years and the values for 44 years after 1876 (1920) will be the same as the value for 1876, the value for 1921 will be the same as the value for 1877, and so on. Thus you really need to calculate only 44 values—after that it is mere repetition.

In practice in rough preliminary work you could set the wave up on a five year basis, dropping out one year in 45. A little less crudely you could set up the wave on a 5 year basis and drop out half a year every 4 1/2 cycles. That was what we did for the wave and synthesis shown on page 246 of this issue. This gave us values as follows:

1876	103.5%	
77	100.7	
78	97.9	
79	97.9	
80	100.7	
81	103.5	
82	100.7	
1883	97.9	
84	97.9	
85	100.7	
86	103.5	4 1/2 years from crest to crest.
87	100.7	
88	97.9	
89	99.3	
90	102.1	
91	102.1	
92	99.3	

Values for the ideal 5 1/2 year wave were obtained in much the same way. As two 5 1/2 year cycles occupy exactly 11 years we could have computed 11 values and then repeated them. Instead, as this was merely reconnaissance and as the wave was small, we used an alternation of 5 and 6 year waves, with values as follows:

1876	100.7
77	95.1
78	95.1
79	100.7
80	106.3
81	103.5
82	98.0
83	92.3
84	98.0
85	103.5
86	106.3
	and repeat

The synthesis then, as said in the beginning, consists merely of multiplying the waves together, thus:

	A	B	C
Year	Values of ideal 4 8/9 year wave	Values of ideal 5 1/2 year wave	Synthesis (A x B)
1876	103.5%	100.7%	104.2%
1877	100.7	95.1	95.8
1878	97.9	95.1	93.1
1879	97.9	100.7	98.6
1880	100.7	106.3	107.0
1881	103.5	103.5	107.1
1882	100.7	98.0	98.7
1883	97.9	92.3	90.4
1884	97.9	98.0	95.9
1885	100.7	103.5	104.2
1886	103.5	106.3	110.0
etc.	etc.	etc.	etc.

Similarly you could go on listing the values, year by year, for each wave, and extending the table as far into the past or the future as you might wish.

A small section of our entire synthesis table looked like this:

YEAR	A 4 8/9-YEAR WAVE	B 5.5-YEAR WAVE	C 6 1/14-YEAR WAVE	D 6 6/7-YEAR WAVE	E 8 1/6-YEAR WAVE	F 9 1/5-YEAR WAVE	G 11-YEAR WAVE	H 12 YEAR WAVE	I 14 1/2-YEAR WAVE	J 21-YEAR WAVE	SYNTHESIS
1876	103.5	100.7	100.0	99.6	92.0	92.2	102.4	100.0	91.5	86.5	71.5
1877	100.7	95.1	96.0	94.6	95.4	84.3	101.0	105.0	88.0	86.5	56.6
1878	97.9	95.1	96.0	93.1	99.5	87.5	99.7	110.1	89.7	89.6	64.0
1879	97.9	100.7	100.0	98.2	103.6	95.3	98.3	115.1	93.2	92.6	93.2
1880	100.7	106.3	104.0	103.3	107.7	103.1	96.9	110.1	96.7	95.7	126.1
1881	103.5	103.5	104.0	108.3	104.9	111.0	96.9	105.0	100.2	98.7	141.3
1882	100.7	98.0	100.0	104.0	100.9	117.2	98.3	100.0	103.7	101.8	125.9
1883	97.9	92.3	96.0	98.9	96.8	109.4	99.7	95.0	107.2	104.8	96.7
1884	97.9	98.0	96.0	93.8	92.7	101.6	101.0	89.9	110.7	107.9	88.4
1885	100.7	103.5	100.0	93.8	94.7	93.7	102.4	84.9	110.7	110.9	92.6
1886	103.5	106.3	104.0	98.9	98.8	85.9	103.8	89.9	107.2	114.0	109.3

TECHNIQUES INVOLVED IN THE DETERMINATION OF THE 19.4-YEAR CYCLE IN RAILROAD STOCK PRICES

Data Used

The data used from 1831 through 1870 are the Cleveland Trust Company Railroad Stock Price Averages multiplied by 1.149 to make them comparable with the figures used from 1871 to date.

From 1871 to date we used the Standard & Poor's Corporation Index of Railroad Stock Prices as extended backward by the Cowles Commission for Research in Economies and adjusted to 1935-39 = 100.

Trend Used

The trend used was a 19-year geometric moving average. A 19-year geometric moving average is merely the 19th root of the product of each 19 numbers in the series taken in turn. In other words a geometric moving average consists of the antilogs of a simple arithmetic moving average of the logs of the data.

The nine values at each end of the series unobtainable by means of a 19-year moving average were added by graphic extrapolation

The 9-year moving average shown in Figure 3 is a geometric moving average of the values plotted in Figure 2. In other words the values are the antilogs of a simple 9-year moving average of the differences between the logs of the data plus two (to convert the answer into percentages), and the logs of the corresponding points on their 19-year moving average.

The broken lines at each end of the curves in Figures 2 and 3 indicate the values derived directly or indirectly from extrapolated trends.

For a definition of moving averages you are referred to page 271 of this issue.

The Period

Nineteen and four tenths years was chosen as the average length of the cycle because this length fits the observed behavior throughout the entire series more closely than any other single length we could have chosen.

Foundation Affairs

THE JOURNAL OF CYCLE RESEARCH

AT last the quarterly **Journal of Cycle Research** is under way. The first issue is due from the printer in a few days. It is 8½ by 11 size and will contain 30 pages, exclusive of covers.

As you know, Dr. Leonard W. Wing, Associate Professor, Department of Wildlife Management, Agricultural and Mechanical College of Texas, is the editor. If you want to submit material or write to him, his address is College Station, Texas.

The **Journal** will be more scholarly and somewhat more formal than our monthly reports, as becomes a strictly scientific publication, but it should not be appreciably harder to read.

There will be some overlapping of subject matter and some duplication of charts but there will be no duplication of text. That is, I may give you in the monthly report an abstract or condensation of some of the material in the **Journal**, and may steal some of the charts used to illustrate this material, but I do not intend to lift verbatim any of the **Journal** articles.

The Table of Contents of Vol. 1 No. 1 of the **Journal of Cycle Research** is as follows:

EDITORIAL

CYCLES IN COMMERCIAL FAILURES, by Edward R. Dewey.

(This paper is an outgrowth of a short memorandum I sent you on April 15, 1950.)

CYCLES IN CANADIAN PACIFIC RAILWAY FREIGHT TRAFFIC, by S. Meredith Rountree.

(This article is the original paper by Mr. Rountree of which I gave you a condensation in the June report. It describes in detail the methods he used in conducting the research.)

CYCLIC TRENDS IN ARCTIC SEASONS, by Leonard Wing.

(This paper and the one which follows it will be completely new to you.)

SYNCHRONIZED CYCLIC PROCESSES, by Jerome B. Tichy.

Material for a number of future issues is already in hand.

UNIVERSITY AFFILIATION

For the successful conduct of its work your Foundation needs an active connection with some good college or university.

Such an affiliation would benefit the college because it could give the college considerable income, considerable publicity, and a certain amount of prestige.

The college would get income by sharing in grants which we might receive from larger foundations, and by added income from alumnae and others who might wish to help it to carry on work in our field.

We on our part would gain by association with the specialists in all the various fields of natural and social science, by the library facilities, and by the opportunity to interest young people in our particular kind of work.

If you have contacts with a college or university which might benefit by such an association, I would appreciate it if you would write me.

NEW COMMITTEE MEMBER

It is a great pleasure to be able to announce the election of Vice-Admiral Harold Gardiner Bowen as a member of the Committee for the Foundation for the Study of Cycles.

Admiral Bowen now is Executive Director of the Thomas Alva Edison Foundation with offices at West Orange, New Jersey. Previously Admiral Bowen had a distinguished career in the United States Navy. By 1935 he had risen to the rank of rear admiral. In that year was appointed Engineer in Chief of the Navy. From 1938 to 1942 he was Director of the Naval Research Laboratory and Technical Aide to the Secretary of the Navy. From 1942 to 1947 he was Special Assistant to the Under-Secretary of the Navy and to the Secretary of the Navy. He was made Chief of the Office of Research and Inventions in May 1946 and made Chief of Naval Research in August of 1946. During this year he was also promoted to the rank of vice-admiral. In 1947 he retired from the navy to become head of the Edison Foundation.

Admiral Bowen brings to the Foundation for the Study of Cycles a wealth of experience and ability and a mind that is not afraid to consider new ideas.

ADMIRAL BOWEN

NEW MEMBERS, SECOND QUARTER 1951

It is a pleasure to welcome the following persons to membership in the Foundation for the Study of Cycles.

April

Duggan, Thomas B., Jr.
King, Donald
Smith, Thomas F., Jr.
Studer, Dr. Edward F.

May

Anderson, William B.
Bieler, L.H.
Carr, Frederick
Chauncey, Albert B.
Cogan, Peter L.
Fox, Henry, Jr.
Gotch, Frank
Harper, A.S.
Keppel, Howard B.
Manion, K.J.
Norris, Abbot L.
Pettinelli, F.
St.John, D.T., Jr.
Searles, Harolde N.,
Slade, E.W.
Swett, Howard D.
Van Loan, H.H.
Wheeler, Nathaniel
Whittier, Ross
Willingham, Spain

June

Agnew, Carroll J.
Austin, Natalie R.
Bartel, William E.
Bell, R.O.
Boehmer, Edwin
Bolling, C.O.T.
Boris, Henry L.
Brown, H.A.Stanley
Brown, Lewis J.
Calder, George C.
Carter, Frederick D.
Chronowski, Alois J.
Cobb, Henry I.
Conley, Lauren H.
Cropper, Paul F.
D'Alemberte, J.H.
Davidson, G.R.
Deaton, A.O.
Dixon, George H.
Freeman, William
Grant, Helen
Hain, Jacob L.
Hagerty, Denis
Hester, John R.
Holland, J. Rich
Hysham, Phil J.
Karp, Richard G.
Kilduff, John F.
Kitchen, Leland J.
Kostman, George
Kramer, Ernest
Kremer, E.A.
Leon, Florence
Lilley, N.J.
MacConel, James M.
Magrin, Barton J.
Martin, E.W.
Metcalf, John R.
Mitchell, Kenneth H.
Morse, Samuel B.
Newbold, Douglas T.
Oaksford, Robert S.
Ovens, J.M.
Palmer, Elwell
Parker, G.N.
Parker, Robert B.
Perry, Joseph Earl
Procker, Anthony
Read, H.W.
Reese, F.C.
Reeves, Douglas F.
Roark, R.E.
Savelli, Richard F.
Schecter, Joseph
Smith, Larry & Co.
Sprague, George F.
Starke, George C.
Taylor, William Clark
Waddell, R.T.
Waite, W.S.,Jr.
Walker, Chester
Wittrock, Robert J.

Letters

A LETTER FROM A SELF-STYLED CYNIC

Dear Sir:

I am the publisher of Pivot Service in which name I received correspondence from you today in connection with the Foundation for the Study of Cycles. Your group had previously been referred to me by one of your sponsors, but I have been questioning the specifications by which you could claim to identify cycles.

Your June 1st letter refers to a projection of stock market " behavior " to 1990 and to " common stock prices " to 1969. What is your distinction between " behavior " and " prices " and why the difference in the final dates if they are similar? Moreover, if there is a 9.2-year cycle in common stocks of what value is a 7-year record from 1944 in market behavior?

By what index do you measure the stock market? By the Dow, or what other major average? By price range or by closing prices? And if either or any, do you use figures as of week-ends, month ends, year ends, or Dow Theory signals?

I am a cynic. The mere statement that a cycle periodicity exists is unacceptable just as a claim. What representations are you free to define?

Yours very truly,
Robert G. Lester

Chicago, Illinois

I wrote in reply:

Dear Mr. Lester:

I would not go so far as to classify myself as a cynic but I certainly join with you in being a skeptic.

Cycles of various degrees of regularity can be found in almost anything including random numbers. The question, therefore, in any given instance is not whether cycles exist but whether the cycles that do exist are regular enough to have any significance. That is, what is the probability of some rhythmic cause for the behavior, rather than a series of sporadic causes.

Tests of Significance

Statistical tests to determine these probabilities are available but are not entirely satisfactory. One is therefore generally thrown back upon the test of common sense and reasonableness, or better yet upon the pragmatic test of whether or not the observed cycle continues after discovery, or whether or not a cycle discovered in part of a series of figures continues in the part that was not used in the determination.

For studying cycles in the stock market I think the best figures to use would be the prices of the stock of some individual company or at least some group, but for the general industrials I feel that the Standard and Poor's Corporation Industrial Index, as extended backwards by the Cowles Commission for Research in Economics has advantages over the Dow-Jones figures, inspite of the more popular appeal and wider circulation of the latter.

The 9-year cycle has been present in the Industrials since 1871 and in Railroads since 1831.

You are right in thinking that seven additional years does not add much in the way of creditability in respect to a 9-year cycle as such, but the projection that I made in 1944 was a synthesis of several cycles and it is encouraging to note that this synthesis fairly well discribes the major moves that have occurred since that date. In other words, it is an indication that we may be on the right track.

The 9-year Cycle has Continued 80 Years Since Discovery

As for the 9-year cycle, it was first discovered about 1870. The fact that it has continued for 80 years after discovery is very convincing evidence of its probable reality.

I made no distinction between " behavior " and " prices " in the letter you refer to. The two words, in this informal promotion letter, were used interchangeably to try to improve the English.

The synthesis was projected to 1990 in belief that that was far enough in advance for any present interest. The study in regard to the 9.2-year cycle projected this cycle only to 1969 for the same reason. Anyone who wants to project it further can do so easily with the information given in the report.

As the questions you raise are very much to the point, I would like to include part of your letter and part of my reply in a forthcoming report to our members unless you object.

Cordially yours,
Edward R. Dewey
Director

You will be interested, I think, in a letter just received from Dr. Donald Thayer Bliss of the Naval Radiological Defense Laboratory in San Francisco. Dr. Bliss' letter was written in response to an article in the June issue in which I attempted to chart average wholesale prices of all commodities from 1932 forward in terms of gold instead of in terms of paper dollars.

You will remember Dr. Bliss as the writer of a letter which appeared in the report for May 1951.

The Letter From Dr. Bliss

Dr. Bliss' letter follows:

Dear Mr. Dewey,

The June Report was most stimulating and intriguing; and that shall provide my excuse for intruding upon what must be, after all, a very busy Director.

A question lingers in my mind concerning the procedure adopted for converting 1933-1950 prices from paper to gold. It is my understanding that the possession of U. S. gold pieces is both illegal and a numismatist's ambition; hence, two diverse factors operate to elevate the price of " double eagles " above the " normal " level. The importance of the " double eagles' " numismatic interest may perhaps be gauged by the fact that raw gold was, if I remember correctly, being sold legally (because of certain loop-holes in the law) in this country at about $54 an ounce, only moderately above the established price. It seems to be possible, therefore, that a correction factor ahould be applied to the " double eagle " price index, a factor which would have the effect of reducing " double eagle" prices and of increasing " real " dollar prices. But, if a correction factor is necessary, what should be its magnitude?

I hope to be enlightened on this point, for if you can assure me that the numismatic correction factor is not large, I can hereafter with a clear conscience praise an Administration which displays so unique a concern for the monetary welfare of its citizens that it has graciously enabled them to possess more dollars by the simple and genial expedient of making dollars cost less.

Respectfully yours,
Donald Thayer Bliss

Berkeley, California

My Reply

In response I wrote as follows:

Dear Dr. Bliss:

You are absolutely right that a correction factor should be applied to the Double Eagle Price Index published in our June report, but I have reason to believe that this correction factor would not be large and that it is not enough to invalidate, for the cycle student, the figures I gave.

Before publishing my article I made extensive efforts to obtain the best possible figures. Among other things I attempted to obtain the price of gold in various foreign countries where free markets might be supposed to exist. Some of the difficulties in connection with free market prices are explained in a letter from Dr. O. Ernest Moore, Manager of the Research Department of the Federal Reserve Bank of New York.

Difficulties in Finding Free Markets

The gist of Mr. Moore's letter is as follows:

Prices for gold on the so-called free markets show widely divergent trends as between countries. The premia on gold, where they exist, reflect the monetary habits of the population, the efficiency and stability of the monetary system, and the degree of confidence in the national government, as well as the varying expectations as to social and international peace. The actual prices embodying these premia are quoted in local, inconvertible currencies. In the press and other published material, reference is often made to dollar quotations for gold on foreign markets, but these are merely computed figures arrived at by converting the local-currency price into dollars at such rates of exchange as may be available. For most local-currency quotations, different dollar equivalents can be obtained by converting the local currency price at different exchange rates (black market, official market, free market, etc.) and it is often difficult or impossible to know which rate should be used in calculating a realistic dollar equivalent. In those instances where the seller of gold wishes to make an actual conversion of his local currency proceeds into dollars, and is able to do so (such conversions being usually prohibited by law), the conversion is ordinarilly made through free or black markets at rates which are usually at a substantial discount from the official rates of exchange.

In continuing my investigations I received a number of letters on the subject from the various friends and members of the Foundation. Two of these letters follow:

Hong Kong Prices

" I regret the long delay in getting you the range of gold quotations you wanted. From Hong Kong all I have so far is the 1950 range, $44 3/4 high (December 29th), $36 7/8 low (June 9th) per Troy ounce of gold in Macao. I have written to London and hope to get more data.....

" Expressed in Hong Kong dollars gold made a low there of 249 1/4 per tael (.945 fine) on June

9th and 329 1/2 on August 2nd and 3rd. The exchange rate for the Hong Kong dollar with ours made a high of 16.78 cents on December 29th (it went as high as 16.77 on June 6th) and a low of 15.60 on January 31st. The latest I have from Hong Kong is for April 28th when gold (Macao) was $45 (U.S.) per ounce, and $321 (H.K.) per tael locally with the Hong Kong dollar at 16.22 cents. One tael is 1.203 Troy ounces."

European Prices

"From a large firm of bullion brokers in London, I have obtained the following estimated range of gold prices since World War II.

	1946	1947	1948	1949	1950
High	38	45	47	52	40 1/2
Low	35	35 3/8	43	40	36 1/2

"These are prices in dollars per Troy ounce. no one in London, it appears, has kept a daily record of gold prices, and they have no record before 1946. These prices are for the gold in the main European centers, which probably show narrower fluctuations than in Hong Kong and other Eastern cities. I believe they are reliable.

"Before 1946 most of the present gold trading centers were in territory of belligerents and I do not think that quotations having any meaning could be obtained for the war years. From 1939 back to 1932 the United States Treasury's price can fairly be used.

"The South Africans recently announced that they were not selling more than 40% of their production in free markets for fear of breaking the price."

As you know, before devaluation (January 31, 1934) the value of gold was $20.67 per fine troy ounce. The present legal value is $35.00 per fine troy ounce.

Black Market Prices
Probably Adequate for Cycle Students

Taking all of these factors into account I think that for purposes of cycle study we can accept as adequate the black market prices of double eagles in New York as furnished by Pick's World Currency Report, 75 West Street, New York City, which were published in the June report. In other words, I believe the enhanced value of double eagles due to the illegality of their possession and due to their interest for coin collectors to be of moderate proportions.

At all events the prices given are vastly closer to the " true " prices than the prices in greenbacks which we are accustomed to read in the newspapers, and they are the best I am able to give you. If you ever come across better figures I would appreciate it if you would let me know.

Legalized Robbery

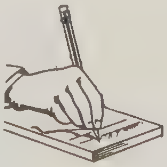
I enjoyed the last paragraph of your letter. Some people express the same idea more directly. For example, Dr. Walter E. Spahr, writing in **Monetary Notes** for June 1, 1951, wrote as follows:

"Apropos the looting of the savers in this country through depreciation of our currency, this author pointed out the following in an address in Washington, D. D., May 10, as an example of the state of affairs that prevails in this country:

"'Perhaps one illustration will suffice to show the subtle aspect of the weakening process inherent in an irredeemable currency, and also how the public fails to react strongly because of lack of understanding of this process:

"'The total loss, because of a depreciated dollar, on the average value of life insurance policies, time deposits in banks, and E, F, and G savings bonds for the years 1941-1950, in 1950 dollars as compared with 1941 dollars, amounted to $116,565,524,000. This huge loss, lightly regarded because so poorly understood, stands in sharp contrast to the officially estimated total loss of $1,901,000,000 by depositors in suspended banks during the years 1921-1933. Regarding the latter loss, extending over thirteen years, and which is only 1/61 of that over ten years on the three items mentioned, we still write and speak with emotion for the reason, apparently, that the meaning of that loss was brought home to us in a manner we could understand. But regarding a loss more than 61 times greater, on only the three items specified, we offer in general little more than platitudinous observations that reveal our small understanding of the devastating effects of a depreciating currency.' "

Very cordially yours,
Edward R. Dewey
Director



Questions and Answers

IDEAL CYCLES VS. ACTUAL CYCLES

Q. In your letter to Mr. McDowell printed in your June report you say, "Bear in mind that the actual low of a cycle almost never comes at the time of ideal low. The actual low may come an important fraction of the cycle ahead or after ideal timing, depending upon circumstances." I do not understand this statement.

A. Cycles are usually measured for length from one top to the next top, or from one bottom to the next bottom.

Tops and bottoms of cycles are also called high points and low points, crests and troughs, peaks and valleys. These terms are all synonyms.

But to answer your question:

An Example

Suppose you had a chart of daily temperature readings at Utopia, Illinois for the period from June 1, 1945 to June 1, 1951, and that you were going to measure each cycle from low to low; that is from the coldest day of one winter to the coldest day of the next winter.

Suppose further that the coldest days of each winter came as follows:

February 1, 1946
March 1, 1947
January 1, 1948
December 1, 1948
April 1, 1950
February 1, 1951

The lengths of each of the five cycles or waves would be as follows:

1st cycle, Feb 1, '46 to Mar 1, '47,	13 mo.
2nd cycle, Mar 1, '47 to Jan 1, '48,	10 mo.
3rd cycle, Jan 1, '48 to Dec 1, '48,	11 mo.
4th cycle, Dec 1, '48 to Apr 1, '50,	16 mo.
5th cycle, Apr 1, '50 to Feb 1, '51,	10 mo.
Total	60 mo.

Five cycles in 60 months gives an average length of 12 months per cycle.

Twelve months thus becomes the average or typical length of the ideal cycle which you are going to draw in and project into the future.

Timing the Ideal Cycle

We have now found the length of the ideal cycle. Next we must find the dates or timing of this ideal cycle. To do this we find the timing which correspondes best to what actually happened. Do lows mostly come at January 1st, or February 1st or some other date? In the example given it is easy to see that February 1st is the date that most nearly corresponds to the timing of all the various actual lows. Two of the lows fall on this date, the others are equal distances before and after it.

Now we have the timing of the ideal cycle (more technically, timing is called **phase**) as well as the length of the ideal cycle (more technically, length is called **period**).

Comparing Actual with Ideal

If you choose February 1st of each year as the time for the low of your ideal cycle, your first ideal low and your first actual low will coincide.

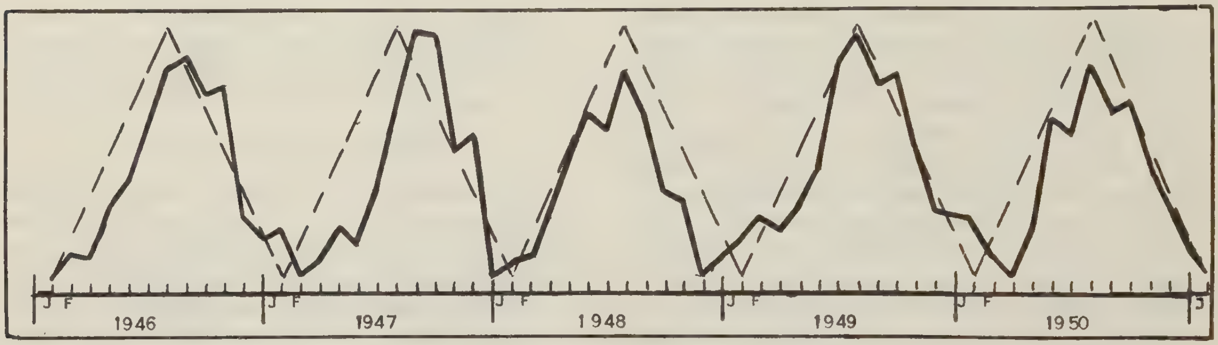
Your next actual low, coming on March 1st would be one month late because your ideal low would always come on February 1st of every year.

Your next actual low would be one month early; your next one would be two months early; your next one would be two months late, and your last actual low would be on time.

There would be six actual lows and six ideal lows and five cycles between them. There would also be as many additional ideal cycles as you wished to draw, because you could draw the ideal cycles for the future as well as for the past.

The Forecast

If the temperature continued to fluctuate in a 12-month cycle with the same degree of regularity as in the period of time for which you have records you can expect the coldest day to come on time about a third of the time, a month early or late about a third of the time, and two months early or late about a third of the time. But unless you can find other cycles in the figures, or have some other means of forecasting, the date of the coldest day of any particular forthcoming year is known only to the gods. A knowledge of this one cycle throws light on the **probabilities** of the future, but it does not give you the complete answer.



WHY THE STOCK MARKET FORECAST OF JUNE 1951?

Q. I infer, from the June issue, that you feel that you could make a very much better forecast of the stock market than the one you showed. Is this true, and if so, why did you print the one you printed?

A. Yes, I am sure I could make a much better forecast of the market.

To answer your second question, I printed this old crude projection because I had to print something in order to keep people from misinterpreting the report in regard to the 9.2-year cycle, and the projection I printed was the best I had available.

The 9.2-year cycle is only one of many forces operating in the stock market, just as wheat flour is only one of many ingredients in chocolate cake.

A Chemical Analysis Analogy

Suppose you took a chocolate cake to a chemist and said, " Tell me what is in this cake so my wife can make one like it. "

If the chemist worked awhile and said, " Well, one thing I find is wheat flour. " you would not rush home and say to your wife, " Give me a dish of flour for dessert. The chemist said that was what chocolate cake is made of. "

Even if you waited a little longer at the chemists' until you heard him add, " And I find egg yolks too. " you would not rush home and ask your wife to give you some egg yolks mixed with flour. (Ugh!)

But that is what people do if you tell them about one or two of the cycles in a series of figures (and I sometimes do it myself!).

The 9.2-year cycle corresponds to the wheat flour; the 19.4-year cycle reported upon in this issue corresponds to the egg yolks. Even the combination of the two of them is no more like actual market behavior than wheat flour and egg yolk is like cake.

My combination of ten of the longer cycles, however, is definitely better. (Proof of the cake is in the eating and my synthesis has worked for seven years.) I have likely missed the sugar, and got calcium cloride instead of sodium chloride (salt), and charcoal instead of chocolate. The mixture is not right and will undoubtedly give you financial indigestion if you eat it, **but it is a cake.**

The results suggest that we are on the right track, and that serious work is called for.

EXPLANATION OF OVERALL AMPLITUDE REQUESTED

Q. What do you mean by " **overall amplitude?** "

A. I do not wonder that you ask, for you will not find this term in any text book of statistics. It is a term we have coined here at Foundation headquarters.

The **amplitude** of a wave is the height of the top or crest of a wave above a straight horizontal line called the **axis** run through the middle of the wave, **or** the depth of the bottom or trough of the wave below this line. The height above the axis is called **positive amplitude**. The depth below the line is called **negative amplitude**.

(The trend is often taken as the axis and the amplitudes are often measured in percentages—that is percentage of trend.

(**Trend** is the tendency of data in a series [of figures] to increase or decrease over a long period of time.—Brumbaugh & Kellogg).

It is often convenient to have a measure of the overall move from crest to trough. This can be obtained by adding the positive amplitude and the negative amplitude, regardless of sign, to get the **overall amplitude.**

If someone will suggest a better term, or a better concept, I shall be glad to accept it.

EXPLANATION OF MOVING AVERAGE REQUESTED

Q. What is a moving average?

A. To answer let me quote a passage from **Cycle Analysis: The Moving Average**, Technical Bulletin No. 4 of the Foundation, to be reprinted in full in an early report:

Averages

Everybody knows that an **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½.

Time Series

An arrangement of numerical items is called a **series**. When the items with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of something for each of four consecutive years, or represent the number of accidents on each of four consecutive days, we would call the figures by this name—a time series.

We could still average the items and say, for example, that the average price for all four years was 11½ cents, or that during the period there were an average of 11½ accidents per day, as the case might be.

We could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (12 + 11 + 13 (36) divided by 3).

Moving Averages

A moving average is merely a succession of averages secured from a series of items by dropping the first item in each group averaged and including the next item in the series, thus obtaining the next average.

Therefore, when you averaged the first three items of our time series (10, 12, and 11) and got 11, and then dropped the first item (10) and added the fourth item (13) and averaged again and got 12, you were constructing a moving average. Easy, wasn't it?

Because you were averaging three items at a time, you would call the result a 3-item moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily data, you would call the result a 3-day moving average.

Additions to the Library

A Lot of Insects, by Frank F. Lutz, G. P. Putnam's Sons, New York, 1941, 304 pages, copiously illustrated.

Dr. Lutz, the author of this book, once took me to task for a paragraph in Foundation Reprint No. 11 which reads as follows:

" The numbers of practically all wild animals of which we have any knowledge show a similar tendency to fluctuate, although the time intervals between crests and between bottoms vary as between animals. We don't yet know enough about this subject to offer any generalizations but it seems as if there might be some rough relationship between the size or life-span of the animal and the rhythms to which it adapts itself. For example, elephants have been reported to have periods of abundance at 62 year intervals, mice plagues come at four year intervals, and swarms of certain insects recur at intervals of about two weeks coinciding, amusingly, for the period for which I have figures, to one of the minor rhythmic ups and downs in the stock market. On the other hand, you can easily upset my generalization by pointing out the 17 year " locust, " a very small animal that has adjusted itself to one of the longer rhythms important in cotton prices. "

When Dr. Lutz told me he had a bone to pick with me in regard to this paragraph I thought I was going to get chided for using the word " locust " to describe the periodic cicada but this is not what was in his mind.

Dr. Lutz felt that as the cycle of abundance of the cicada is caused by a 17-year period of " hibernation" of the newly hatched insects, it should not be lumped with cycles of abundance of mice, elephants, insects, lynx and so on where the fluctuation is due to more and more animals, up to a maximum, then fewer and fewer animals to a minimum.

My retort to this comment was that from the standpoint of the study of cycles the **cause** of the cycle was not of immediate concern.

In each case a knowledge of the cycle involved gives predictability. In each case the animal had found its chances of survival improved by adapting itself to periodic behavior. And in each case a knowledge of other phenomena which fluctuate in the same cycle may give a hint as to the ultimate cause.

If you read Dr. Lutz's entertaining book, you will learn, as the title implies, a lot about insects—but not very much about cycles.

• • •

" Banking and the Dawning Science of Cycles, " an address before the Vermont Bankers Association, by Joseph Earl Perry, 18 pages, mimeographed. Gift of Mr. Perry.

If you write to Mr. Perry, who is President of the Newton Savings Bank at Newton, Massachusetts, I am sure he will be glad to send you a copy of his address—while the supply lasts.

• • •

Journal of Human Ecology, Volume I, No. 8, 8 pages, 1 chart; Volume I, No. 10, 7 pages, 1 table, references. Gift of the Weather Science Foundation.

Volume I, No. 8, consists of a paper by Dr. Frederick Sargent II illustrating the interdependence of weather and cerebral hemorrhage.

Volume I, No. 10, consists of a paper by Dr. Frank L. Rosen entitled " Bronchial Asthma and the Weather. "

There is nothing in either of these papers in regard to cycles as such, but as there are cycles in weather, if there is an interrelation between weather and disease, there may be corresponding cycles in desease also.

Correlation of Cycles in Weather, Solar Activity, Geomagnetic Values, and Planetary Configurations, by Maxwell O. Johnson, Phillips & Van Orden Company, Inc., San Francisco, 1946, 149 pages, references, 40 tables, 7 figures. Price $4.00. Gift of Mr. Johnson.

Shorter Cycles in Rainfall, by Maxwell O. Johnson, Phillips & Van Orden Company, Inc., San Francisco, 1947, 66 pages, references, 3 tables, 22 figures. Price $3.00. Gift of Mr. Johnson.

Cycles in Weather and Solar Activity, by Maxwell O. Johnson, Paradise of the Pacific Press, Honolulu, 1950, 224 pages, references, 13 tables, 37 figures. Price $5.00. Gift of Mr. Johnson.

These three books, published in the order in which they are listed above, will be reviewed for you at length as soon as time permits.

They are distinguished by the author's concept of the concurrent existence of a multitude of wave lengths, and by original methods of analysis. They are good books to add to your cycle library.

● ● ●

" Report of the Ordinary General Meeting of the Association, " reprinted from the **Journal** of the British Astronomical Association, Vol. 61, No. 5, pp 126-128, 1951 April, 2 pages. Gift of Mr. D. J. Schove.

This report is quoted in full on page 253 of this issue.

● ● ●

" A Sun-Spot Synopsis, " by Walter G. Bowerman, reprinted from **Popular Astronomy**, Vol. LII, No. 10, December, 1944, 15 pages, 4 charts, 9 tables, bibliography. Gift of the author.

Mr. Bowerman describes this paper as " chiefly a review of some of the major work which has been done " in connection with " the tabulation of relationships among facts [in regard to sunspots], an estimation of their value by statistical methods, and the tentative establishment of laws regulating them."

" Wideawake Fair " in " Marginalia ", by G. Evelyn Hutchinson. **American Scientist**, Vol. 38, No. 4, October 1950. Gift of Mr. Guy A. Wainwright.

This article discusses the breeding seasons of birds and calls attention to the fact reported by Moreau that on Ascension Island in the mid-Atlantic the wideawakes, a kind of tern, return for breeding purposes about every nine months. Moreau calls this cycle " one of the most remarkable phenomena of breeding-periodicity in the world. "

The article goes on to say that " Chapin has studied a number of as yet unpublished modern records kept with great care in recent years, and is entirely convinced of the regularity of the occurrence. The mean interval between the arrival of the birds, the first step in the breeding cycle, is 9.3 months. From the time the birds arrive, they apparently proceed with breeding activities irrespective of the time of year. No known meteorological or oceanographic cycle is available to explain the phenomenon, which for the time being must be supposed to depend on internal physiological factors. This is particularly remarkable when it is remembered that the birds are supposed to disperse widely throughout the tropical South Atlantic when not breeding at the island."

● ● ●

" Pollen Records from Lakes in Anoka County, Minnesota: A Study on Methods of Sampling," by Ira T. Wilson and J. E. Potzger. Reprinted from **Ecology**, Vol. 24, No. 3, July 1943. 11 pages, 2 tables, 2 figures. Gift of Dr. Wilson.

Borings indicate different numbers of pollen grains from different kinds of prehistoric trees, grass, etc. at different depths in bogs and lake bottoms. Cycles could perhaps be isolated in the data recorded but as no way is shown to translate cycles in terms of feet of depth into cycles of years and centuries, the resultant information would be of little value for students wishing to tie the results into cycle research in other fields.

Mr. Nelson D. Griswold
1514 West 4th St.
Freeport, Texas 1207
Jan

Announcing--

THE JOURNAL OF CYCLE RESEARCH

Leonard Wing, Editor

This publication is a quarterly scientific Journal devoted to the subject of cycles. Volume I, Number 1 is now ready for distribution.

Subscription price is $5.00 per annum.

If you wish to receive this new magazine, send your check to the publication office of the Foundation at 9 East 77th Street, New York 21, New York.